RAILROAD MAN'S MAGAZINE

NEW CHANCE *for* OLD HEADS
Young Railroaders Released *for* War *by the* Return *of* Veterans

BIG RAILROADING - 3
New York Central Has Spent $600,000,000. in 16 Years on Improvements

OLD TIMES *on the* NORTHERN PACIFIC
By "J. E. M."

DUPLEX TELEGRAPHY EXPLAINED
By Samuel W. Beach

BUILDING BIG BUSINESS *on* BRAINS
By C. F. CARTER – Wonders of the General Electric Company's Science Factory

LOTS OF ILLUSTRATIONS

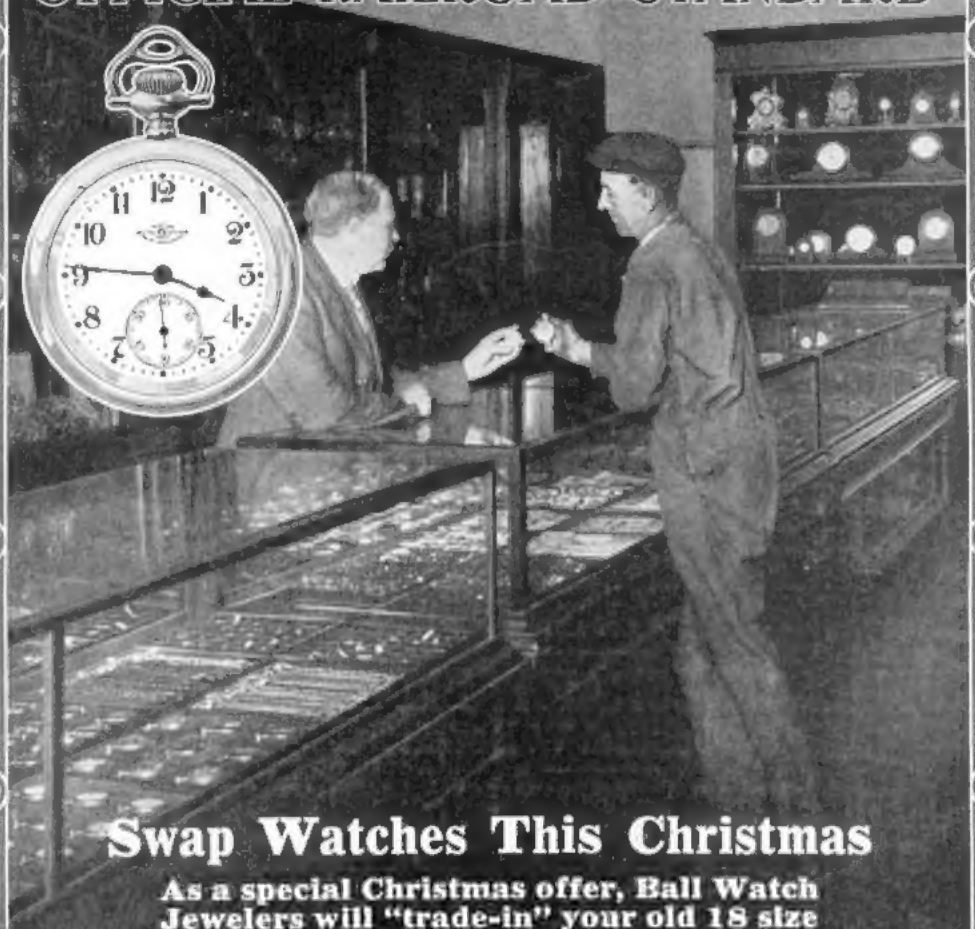
10¢ PER COPY

CHRISTMAS

BY THE YEAR $1.00

BALL WATCHES

OFFICIAL RAILROAD STANDARD



Swap Watches This Christmas

As a special Christmas offer, Ball Watch Jewelers will "trade-in" your old 18 size watch, allowing a liberal amount as part payment on a new light weight, 16 size, Twentieth Century Model Ball Watch.

Better talk to your home jeweler about it at once. The demand is greater than the present rate of production.

The Webb C. Ball Watch Company (18)

CLEVELAND, OHIO

CHICAGO—Garland Bldg. WINNIPEG—Confederation Life Bldg.

SAN FRANCISCO—Flood Bldg.

FC

This Coupon Brought Two Promotions in 2½ Months

A FEW months ago, George Yeck of Dixon, California, clipped the coupon from a Department of Signaling advertisement. He saw the opportunity for advancement in Signal Engineering. The other day he wrote as follows:

"The first month I had to do all the hard work. I think that the signal foreman and supervisor wanted to find out what I was made of, but the second month I got promoted with a raise in salary. On May 16th, I got promoted again with another raise in salary. So, in two months and a half, I am one of the highest paid men in the signal gang, thanks to your wonderful course. There is one man who has been working here for four years, and all the rest of the men have been working here longer than I have, but they do not receive the salary that I do. They all say I have a pull with the boss but I know better. It is the splendid training I received from you that is doing the work." **And what Mr. Yeck did, you can do.**

If you join the army or navy before you have completed the course, your course of study may be resumed upon your return without any additional fees.

Men Are Needed to Accept High Salaried Positions!

Men are needed in the profession of Signal Engineering. There are thousands of miles of railroads that must be equipped with block signal systems. States are passing laws that require automatic block signals on all railroads. To superintend these installations and maintain the systems now in use, thousands of men are necessary. Golden opportunities are offered. The work is big and broad—high salaries are paid. $250.00 a month is an ordinary salary for a Signal Engineer.

Send the Coupon for Free Book

Put your name and address in the coupon or in a letter or post card now and get the free book about Signal Engineering. Find out about the opportunities that are offered to you. Read how you can learn to become a Signal Engineer right in your own home. You will be under no obligations. Send the coupon now—today.

Department of Signaling
Dept. 1098—1810 Wilson Ave., Ravenswood Station, Chicago

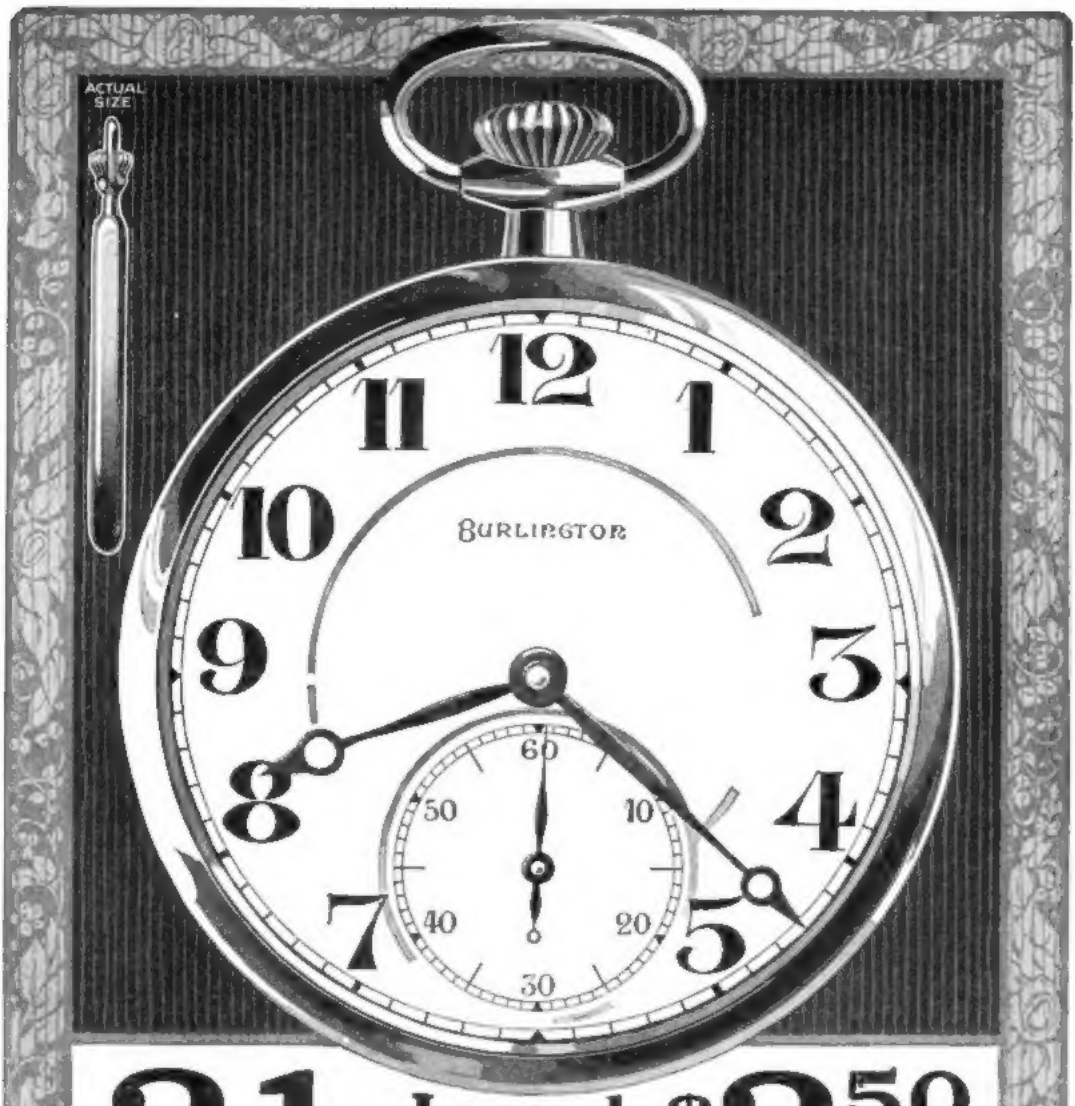
Department of Signaling
Dept. 1098 — 1810 Wilson Avenue
Ravenswood Station, Chicago, Illinois

Gentlemen: Please send me absolutely free and prepaid your big new book on Signal Engineering. Also full particulars about your great special free outfit offer. It is distinctly understood that I assume no obligation of any kind.

Name .....

Address .....

Age ..... Occupation .....



21-Jewel Burlington $2.50 A Month

This superb 21-Jewel Burlington watch, with all these exceptional features, sold direct to you at the rate of only $2.50 per month. Positively the exact price the wholesale dealer would have to pay us. Think of it:—Only $2.50 per month for this high-grade guaranteed watch *direct* at a remarkable price.

Look! { *21 Ruby and Sapphire Jewels— Adjusted to positions— Adjusted to the second— 25-year gold strata case— Adjusted to temperature— Genuine Montgomery Railroad Dial— Adjusted to isochronism— New Art Designs—Extra Thin Cases.*

BURLINGTON WATCH CO.
19th St. & Marshall Blvd., Dept. 9099, Chicago

Please send me (without obligation and prepaid) your free book on watches with full explanation of your cash or $2.50 a month offer on the Burlington Watch.

Name.....

Address.....

.....

Catalog of Art Designs!

Get the Burlington Watch Book—see all the latest Art Designs and Thin Cases. Learn the inside facts about watch prices and many superior points of the Burlington. Send for free Watch Book today.

Burlington Watch Co. 19th St. & Marshall Blvd. Dept. 9099, Chicago, Ill.

RAILROAD MAN'S MAGAZINE

CONTENTS FOR DECEMBER, 1917

The entire contents of this magazine are protected by copyright, and must not be reprinted without the publishers' permission.

FEATURES

BUILDING BIG BUSINESS ON BRAINS. (Illustrated) . . . . Charles Frederick Carter . 529
SPEEDING UP LOCOMOTIVE REPAIRS. (Illustrated) . . . . J. W. Greenberg . . . 550
BIG RAILROADING—3. Second Series. (Illustrated) . . . . . Charles Frederick Carter . 556
LOOKING BACK ON SOUTHERN RAILS. (Illustrated) 574
SAM LOYD'S RIDDLES FOR RAILROADERS. (Illustrated) . . Sam Loyd 577
OLD TIMES ON THE NORTHERN PACIFIC . . . . . "J. E. M." 579
HITTING THE BALL FOR UNCLE SAM 625
NEW CHANCE FOR OLD HEADS. (Illustrated) . . . . . Frank Kavanaugh . . . 627
WITH THE TRAVELING AUDITOR . . . . . P. G. Estee 637
COLONEL VANDERBILT'S INVENTIONS. (Illustrated) . . . Remsen Crawford . . . 647
SOME FREAK RAILROAD LAWS . . . . . George Goode 651
RETURNING YOUR LOST PROPERTY. (Illustrated) . . . . Richard Whitman . . . 688
THESE HOGS ARE CAPACITY CHAMPIONS. (Illustrated) . . William H. Easton . . 694

FICTION

BOOMER JONES DISCOURSES ON LOVE . . . . . J. W. Earp 544
SEVEN SECTIONS OF SIX . . . . . Arthur Lakewood . . . 569
YOUNG ORDEN PUTS 'EM IN TO CLEAR. A Five-Part Story—Part Four . . . . . William Wallace Cook . 588
"PEP," THE CIRCUS PRESS-AGENT . . . . . William H. Seymour . . 619
TRIPPING DOWN THE OLD MISSISSIP'. A Six-Part Story—Part Four . . . . . Raymond S. Spears . . 657

DEPARTMENTS

BY THE LIGHT OF THE LANTERN. (Illustrated) 604
TELEGRAPHIC AND TELEPHONIC. (Illustrated) 612
FROGS 634
WITH THE INVENTORS. (Illustrated) 643
WITH THE THROTTLE WIDE OPEN . . . 697
HELP FOR MEN WHO HELP THEMSELVES. No. 87. Duplex Telegraphy. (Illustrated) Samuel W. Beach 675
THE SUNNY SIDE OF THE TRACK 698
ON THE EDITORIAL CARPET 699

MISCELLANY

STEAM SPEAKS! (Poem) . . . . J. Paul Gruet 543
I. I. OK. AY. (Poem) . . Elmer Edmond Johnson 549
THE RAILROAD PLAN (Poem) . Lee Shippey 553
THE CORN-FED MULES AND THE BOOK OF RULES (Poem) . . . Alten W. Curley 554
GOOD ADVICE. (Poem) . . Margaret G. Hays 568
RETRIBUTIVE. (Poem) . . . Wilson Nixon 572
THE SLANGLESS RAILROAD. (Poem) Frank Gilbert Roe 573
H. G. KELLEY NEW GRAND TRUNK HEAD (Illustrated) 587
BEAUTY SWINGS THE CONTROLLER. (Ill.) 603
CAR-CLEANING MADE EASY IN FRANCE. (Illustration) 617
SHAKESPEARE AND THE TELEGRAPH. R. O'Heed 618
IN MEMORIAM. (Poem) . . Clifford Levin 624
A MAIMED OPR WHO CAN'T BE FEEZED. (Illustration) 626
THE BUILDERS (Poem) . Lydia M. Dunham O'Neil 632
ROLLING-STOCK UNDER GUN-FIRE. . (Ill.) 633
SEEN THROUGH THE CAR-WINDOW. . (Ill.) 635
SONG OF THE EAST-BOUND (Poem) James W. Bennett 636
A WAR-TIME RAILWAY TRACK SUPPLY. (Illustration) 642
THE TROOPS ARE ON THE TRAIN. (Poem) C. W. Durr 646
THE UTOPIA RAILROAD. (Poem) Henry L. Myers 650
THEY ALL DO IT. (Poem) . . Robert D. Lukens 654
FIVE CARS USED TO CARRY ONE GUN. (Illustrated) 655
MY BEST GIRL. (Poem) . . Owen Hugh O'Neil 656
THE TELEGRAPHER'S BATTLE-FLAG. (Ill.) 674
OUTCLASSED (Poem) . . . . . C. L. Funnell 686
WAR-RAILROADING ON THE SOMME. (Ill.) 687
THE OLD SWITCH GOAT. (Poem) J. E. Chrisman 693
SNATCHED OFF THE MAIL-CRANE 700
SONGS BY BARDS OF RAIL AND WIRE . . 704

THE FRANK A. MUNSEY COMPANY, 8 West Fortieth Street, New York, and Temple House, Temple Avenue, E. C., London

FRANK A. MUNSEY, President RICHARD H. TITHERINGTON, Secretary CHRISTOPHER H. POPE, Treasurer

Single copies, 10 cents. By the year, $1.00 in United States, its dependencies, Mexico and Cuba; $1.50 to Canada, and $2.00 to Foreign Countries. Remittances should be made by check, express money order or postal money order. Currency should not be sent unless registered

ISSUED MONTHLY.

COPYRIGHT, 1917, BY THE FRANK A. MUNSEY COMPANY

ENTERED AT THE NEW YORK POST-OFFICE AS SECOND-CLASS MAIL MATTER—COPYRIGHTED IN GREAT BRITAIN

Play Billiards!

Keep the Home Fires Burning

Carom and Pocket Billiards are an all-year sport—brimful of fresh surprises every game! This is not forced exercise, but healthful fun; and it brings to players life-long benefits.

Shared by boys and girls, and mothers and "old boys"—billiards instils the love of home in all. With practice you can soon control the balls, but not the merry flow of jest that often makes the best of players lose.

Give your home Carom and Pocket Billiards—not "some-time," but NOW—*this* Christmas. A small part payment puts a scientific Brunswick Table in your home. Pay the balance monthly—as you play.

BRUNSWICK
HOME BILLIARD TABLES

Send Your Address For Billiard Book FREE

Life, speed, accuracy and lightning action—beautiful cabinet work in rosewood, mahogany, oak and walnut. Brunswick "Quick Demountable" Tables fit all size rooms, and are easily folded when not in play.

"Baby Grand" home-size regulation styles for spare-rooms, lofts, basements, or private billiard rooms. Balls, Cues, Rack, Markers, Tips, Cue-Clamps, expert book of 33 games, etc., all included *free*.

Write at once for handsome color-book—"Billiards—The Home Magnet" and pick out the size and style best fitted to your home.

Low prices, easy terms and home trial offer included.

Mail the coupon for this interesting book at once.

THE BRUNSWICK-BALKE-COLLENDER CO.

Dept. 59U, 623-633 S. Wabash Avenue, Chicago

Dealers, Write for Attractive Agency Proposition

THE BRUNSWICK-BALKE-COLLENDER CO.

Dept. 59U, 623-633 S. Wabash Avenue
Chicago, Ill.

Send me one of the free color-books—"BILLIARDS—The Home Magnet" and tell me about your home trial offer.

Name _____

Address _____

Classified Advertising

The Purpose of this Department is to put the reader in touch immediately with the newest needfuls for the home, office, farm, or person; to offer, or seek, an unusual business opportunity, or to suggest a service that may be performed satisfactorily through correspondence. It will pay a housewife or business man equally well to read these advertisements carefully.

"A New Force in Business" is a booklet that tells how to advertise successfully in the Classified Department of the Munsey Magazines. Mailed anywhere on request.

Classified Advertising Rates in The Munsey Magazines

	LINE RATE	
Munsey's Magazine . .	$1.50	Combination line rate $4.00 less 2 per cent cash discount.
THE ARGOSY COMBINATION		
The Argosy . . .	1.50	
All-Story Weekly . .		
Railroad Man's Magazine,	1.00	

Feb. Railroad Man's Magazine Forms Close Dec. 10th.

AGENTS & SALESMEN WANTED

ONE THOUSAND DOLLARS REWARD if this is not the greatest money-making house-to-house proposition. **N. R. G. Laundry Tablets** wash clothes in ten minutes, without rubbing. Contains no Lime, Lye, Paraffin, Wax or other injurious chemical, and cannot possibly injure the clothes or hands. Positively the wonder of the age—sells for 15c enough for five family washings. We supply **Free Samples** and guarantee the sale of every package you buy. **Just Leave The Free Sample** with the housewife and, when you call again, she is eagerly awaiting to become your steady customer. Secure territorial rights at once, or you will regret it. A 1c postal brings sample and full particulars. Farquhar-Moon Mfg. Co., Desk D-221, 140 W. Van Buren Street, Chicago, Ill.

HOSIERY AND UNDERWEAR MANUFACTURER offers permanent position supplying regular customers at mill prices in home town. $50.00 to $100.00 monthly. All or spare time. Credit. H. Parker Mills, 2733 No. 12th Street, Philadelphia, Pa.

SWELL SUIT FREE FOR 2 HOURS' WORK. Show it to your friends and make $5.00 an hour in your spare time. We show how. Costs nothing to try. Write quick for measure blank and our handy sample outfit. All Free. We deliver everything free. Look into this. Paragon Tailoring Co., Dept. 1203, Chicago.

AGENTS—EARN $75 A WEEK TAKING ORDERS FOR BUCKEYE RAINCOATS. Free sample and outfit. Write at once. Buckeye Mfg. Co., 4 Lincoln Building, New York.

INSYDE TYRES—Inner Armor For Auto Tires. Doubles mileage, prevents 90% of all punctures and blow outs. Thousands in use. Tremendous demand. Big sales. Liberal profits. Details free. American Automobile Accessories Co., Dept. 166, Cincinnati, O.

WANTED—RELIABLE MEN AND WOMEN to place our EGGINE in stores and appoint sub-agents. Takes the place of eggs in baking and cooking at less than 9c a dozen. Chas. Morrissey Co., R-4417-19 Madison Street, Chicago, Ill.

FREE SAMPLE WITH PARTICULARS. NO SPLASHING WATER STRAINERS. Easy seller. Returns big. Experience unnecessary. A. D. Union Filter Co., New York.

AGENTS—500% PROFIT. FREE SAMPLE GOLD AND Silver Sign Letters for store fronts and office windows. Anyone can put on. Big demand everywhere. Write today for liberal offer to agents. Metallic Letter Co., 410 N. Clark St., Chicago.

AGENTS—SNAPPIEST HOUSEHOLD LINE ON EARTH. Red hot sellers, steady repeaters—100% profit. 500 light weight, fast selling, popular priced necessities. Agent's outfit free. Get busy—quick. Write today; postal will do. American Products Co., 4636 Third Street, Cincinnati, Ohio.

BEST RAINCOAT PROPOSITION EVER OFFERED. Easy sales. Big commissions. Agents making $50 to $100 per week. Sample coat and outfit free. Write quick. Tiffany Raincoat Co., 1047-Q Belden Avenue, Chicago.

GET INTO A BIG PAYING BUSINESS FOR YOURSELF handling a very attractive specialty for cigar stands, cafes, barbers, and drug stores. Double your investment in 60 days. Dept. 2. Ad-Lee Novelty Co., 28 W. Washington, Chicago.

Armstrong Earned $67.50 First Day selling our new business necessity. Retails $5.00 to $30.00. Agents profit 150%. Buyer satisfied or money back. No competition. Exclusive territory. Free sample. Sayers Co., 411 Wainwright, St. Louis, Mo.

FREE TO MAN LIVING IN SMALL TOWN OR ON R. F. D. Suit tailored in latest style; chance to make extra money in spare time. For free samples, latest fashions, great offer, write Knickerbocker Tailoring Co., Dept. 670, Chicago.

Write For Liberal Free Sample—Get posted on biggest money-making combinations and specialties. Guaranteed tremendous sellers. Samples furnished free to distribute. Special large profit offers made now. R. R. Newberry, 206 Peoria, Chicago.

EVERY HOME OR FARM, IN SMALL TOWN OR SUBURB needs and will buy the wonderful Aladdin kerosene (coal-oil) Mantle Lamp. Five times as bright as electric. Tested and recommended by Government and 84 leading Universities. Awarded Gold Medal. One farmer cleared over $800 in six weeks. Hundreds with rigs or autos earning $100 to $300 per month. **No capital required; we furnish goods on time** to reliable men. Write quick for distributor's proposition and lamp for free trial. Mantle Lamp Co., 502 Aladdin Building, Chicago, Ill.

GET DAVIS' "PROSPERITY OFFER." Best in 21 years. $10 daily a cinch. Our products at 1-2 to 1-3 store prices cut cost of living, making sales Easy. E. M. Davis, Dept. 45, 910 Lake, Chicago.

BUSINESS OPPORTUNITIES

BE A BUSINESS BROKER; EARN $1,000 TO $10,000 YEARLY. Practical with small capital. Six successful years to my credit. Particulars free. Miss Jack Eydman, 1528 Chemical Building, St. Louis, Mo.

Invention Of Century. Woodpulp Seamless Sanitary Milk Bottle and Containers; Probably create monopoly; Remember monopoly profits and write for particulars regarding manufacturing rights, etc. Home Securities, First National Building, Oakland, Cal.

AGENTS & SALESMEN WANTED

$1000 PER MAN PER COUNTY—STRANGE INVENTION STARTLES WORLD—agents amazed. Ten inexperienced men divide $40,000. Korstad, a farmer, did $2,200 in fourteen days. Schleicher, a minister, $195 first twelve hours. $1200 cold cash made, paid, banked by Stoneman in thirty days; $15,000 to date. A hot or cold running water bath equipment for any home at only $6.50. Self-heating. No plumbing or waterworks required. Investigate. Exclusive sale. Credit given. Send no money. Write letter or postal today. Allen Manufacturing Company, 423 Allen Building, Toledo, Ohio.

WE START YOU IN BUSINESS, FURNISHING EVERYTHING; men and women, $30.00 to $200.00 weekly operating our "New System Specialty Candy Factories," home or small room anywhere. No canvassing. Opportunity lifetime. Booklet free. Ragsdale Co., Drawer 92, East Orange, N. J.

1917 SPRING SUIT FREE—A WONDERFUL AMAZING OFFER—If you are a live wide-awake man, we want you to get one of our elegant spring suits, made to your measure, absolutely **Free.** You can make $25.00 extra every week and get your own clothes without cost. Write us at once and get details of this "Startling Offer." Spencer Mead Company, **Dept. 1160, Chicago.**

AGENTS — STEADY INCOME. Large Manufacturer of **Handkerchiefs and Dress Goods,** etc., wishes representative in each locality. Factory to consumer. Big profits, honest goods. Whole or spare time. Credit given. Send for particulars. Freeport Mfg. Co., 41 Main Street, Brooklyn, N. Y.

RAILROAD MEN ADD MANY DOLLARS TO THEIR SALARIES during spare time selling Transparent Handled Novelty Knives with name, address, photo, lodge emblems, etc., showing under the handle. Lightning sellers. We show you how. Also want agents who can give full time. Big profits guaranteed. Novelty Cutlery Co., 111 Bar Street, Canton, Ohio.

AGENTS WANTED—Agents Make 500 Per Cent Profit selling our Auto Monograms and Initials, Window Sign Letters, Changeable Signs, and Show Cards. 1000 Varieties. Enormous Demand. Sullivan Co., 1125 Van Buren Street, Chicago, Ill.

MAN IN EACH COUNTRY COMMUNITY And Every Small Town. Wear beautiful tailored suit, be agent in spare time. No experience required. Write for free samples, latest fashions, all details. Banner Tailoring Co., Dept. 626, Chicago.

MAKE MONEY IN THE CANDY BUSINESS. Get into this big-paying, fascinating business; retail, wholesale; start at home. It's clean, easy big profits. Complete equipment Free. Write for book, tells how to start. Otter-Swain Corporation, Suite 132, 4750 Broadway, Chicago.

AMAZING, New Invention, Marvelous Adding Machine. Retails $7.50. Adds, Subtracts, Multiplies. Does work of $200 machine. Five-Year Guarantee. Offices, stores, factories buy from one to dozen. Enormous demand. Splendid profits. Write quick for protected territory. Dept. 502, Calculator Corp., Grand Rapids, Mich.

$50 A WEEK UP. ALL THE FREE CLOTHES YOU WANT TO WEAR simply to advertise us. Write today for self measuring blanks, style chart, big book of samples, etc. Send no money. A postal card brings all. We pay expressage on everything. American Woolen Mills Co., Dept. 1203, Chicago.

POSTAL BRINGS POSITIVE PROOF OF REMARKABLE REPEAT ORDER PROPOSITION; an opportunity to own your own business; tremendous profits; experience unnecessary. Equitable Corporation, 528 Ohio, Chicago.

Agents, Grab This Quick. Take orders for "Kantleak" Raincoats. I paid Ed Bridge $88.95 for one week's spare time. Cooper making $300 monthly. Wonderful values. A dandy coat for $3.98. Other styles to $15. Four average orders a day gives you $2100 a year profit and a Free automobile. No delivering or collecting. Complete sample outfit all Free. Big season just starting. Hurry. Comer Mfg. Co., Dept. X-12, Dayton, Ohio.

WOULD YOU LIKE TO WEAR A BEAUTIFUL NEW SUIT, made to your own measure Free, and make $35 to $50 every week? You can be the best dressed man in your town and earn a lot of extra money if you write at once for our beautiful samples and wonderful offer. **The Progress Tailoring Co., Dept. 262, Chicago.**

RAILROAD BOOKS AND CHARTS

American, Atlantic, Consolidation, Mikado Locomotives; also passenger, sleeping and freight car charts. Accurately drawn. Every part named and numbered. Easy to understand. Complete set of five for $1 or 25c each. All kinds of books on railroading and telegraphy. Send 2c stamp for valuable free catalogue. **Railroad Book Supply Co.,** 898 Columbus Ave., New York City.

LOOSE LEAF BOOKS

A GENUINE LEATHER COVER, LOOSE LEAF MEMO BOOK, 50 Sheets Paper. Your name Stamped in Gold on Cover. Postpaid 50 cents. Loose Leaf Book Co., Box 6, Station L, New York City, Department No. 1.

HELP WANTED

FOREMEN, SHOPMEN, AND OFFICEMEN WANTED to work spare time as special representative of large well-known mail-order house, selling Watches, Diamonds, and Jewelry on Credit. Liberal commissions and exclusive sales rights granted. No investment or deposit required for outfit or samples. Write at once for details. Address S. D. Miller, Dept. 27, Agency Division, Miller Building, Detroit, Mich.

MEN WANTED FOR DETECTIVE WORK. Big demand at the present time; also instructed by former U. S. Government detective. Write J. Ganor, Danville, Ill.

THE WAY TO GET A GOVERNMENT JOB is through the Washington Civil Service School. We prepare you and you get a position or we guarantee to refund your money. Write to Earl Hopkins, President, Washington, D. C., for book FK 31, telling about 292,366 government positions with lifetime employment, short hours, sure pay, regular vacations.

FIREMEN, BRAKEMEN, BAGGAGEMEN, 8 hours, $140. Colored Porters wanted everywhere. Experience unnecessary. 830 Ry. Bureau, East St. Louis, Ills.

BE A DETECTIVE—EARN $150.00 TO $300.00 MONTHLY. Easy work; we show you; open to all; experience unnecessary. Full particulars mailed to you. Write Wagner, 180 East 79th St., New York, Department 105.

Railway Mail Clerks Wanted. Men, 18 or over. Commence $75 month. Every second week off with pay. Education unnecessary. Sample examination questions free. Write immediately. Franklin Institute, Dept. R-2, Rochester, N. Y.

BE A DETECTIVE—EARN FROM $150.00 TO $300.00 PER MONTH. Travel over the world. Write C. T. Ludwig, 212 Westover Building, Kansas City, Mo.

GOVERNMENT JOBS FOR AMERICAN CITIZENS pay $900 to $1800 yearly. Prepare for coming "exams" under Former U. S. Civil Service Sec'y-Examiner. Book Free. Patterson Civil Service School, Box 1303, Rochester, N. Y.

TELEGRAPHY

TELEGRAPHIC—BOTH MORSE AND WIRELESS. Also Station Agency, taught quickly. **Tremendous demand**—much greater than supply. **Permanent positions secured. Big salaries**—recently raised. **Ideal working conditions**—short hours, vacations with pay, sick and death benefits, etc.—prevailing. **Great opportunities for advancement. Women operators** also greatly desired by Railways and Western Union. Tuition reasonable. Cheap living expenses—can be earned. Oldest and largest school—established 43 years. Endorsed by Railway, Western Union and Marconi Telegraph Officials. Large illustrated catalogues free. Correspondence courses also. Write today. **Enroll immediately.** Dodge's Institute, 9th Street, Valparaiso, Indiana.

TYPEWRITERS

300 TYPEWRITERS $10 UP. Rebuilt, Underwoods, $25. Olivers, $19. Smiths, $13. Remingtons, $19. Write for Bargain List. Free Trial Offer. Every One Perfect. 5 years' guarantee. Typewriter Exchange, R 193 N. Dearborn Street, Chicago.

NEW, REBUILT AND SLIGHTLY USED TYPEWRITERS $8 up. Portable Machines $10 up. Write for our Catalog 65-L. Berar Typewriter Co., 58 W. Washington St., Chicago.

TYPEWRITERS FOR SALE.—ALL MAKES At All Prices. Factory rebuilt and second-hand machines, from $2.00 up. Every machine guaranteed. Ask for price-list and special offer on Underwood's and Oliver's factory rebuilts. Typewriter Exchange, Dept. R, 212 E. Fifth St., Cincinnati, O.

Typewriter Prices Smashed. "Spot Cash" Guerts will save you money. Rebuilt L. C. Smiths, Olivers, Remingtons, Underwoods, Hoyals, etc. Your choice of 500 machines at $10 to $15. Guaranteed for 3 years. Send today for descriptive circular. Dearborn Typewriter Co., Dept. 12, Rand McNally Bldg., Chicago.

Largest Stock of Typewriters in America. Underwoods one-fourth to one-half manufacturer's prices, rented anywhere, applying rent on purchase price; free trial; installment payments if desired. Write for rebuilt catalogue 101. Typewriter Emporium (Estab. 1892), 34-36 West Lake Street, Chicago, Illinois.

TOOLS

TOOLS—For shop, factory, garage and home—many high class tools attractively priced in our "Odds and Ends" pamphlet which is mailed free on request by Montgomery, Inc., 107 Fulton Street, New York City.

REAL ESTATE—FARM LANDS

MICHIGAN

14c A DAY. THINK OF IT. This will buy 10 acres of good land in Michigan's Fruit Belt. Fine for poultry, fruits, truck. Towns, schools. Write for information. George W. Swigart, T1245, First National Bank Bldg., Chicago, Ill.

SOUTH

SETTLE IN THE SOUTH where opportunity awaits the farmer. Good land, big crops, agreeable climate, excellent schools, churches and neighbors. Send name and address for beautifully illustrated magazine "The Southern Homeseeker" that tells about the exceptional opportunities for low priced, productive land along the N. & W. Ry. Year's subscription Free. Address F. H. LaBaume, Agricultural Agt., N. & W. Ry., 324 Arcade Building, Roanoke, Va.

PATENT ATTORNEYS

PATENTS THAT PROTECT AND PAY. ADVICE AND BOOKS FREE. Highest references. Best results. Promptness assured. Send sketch or model for search. Watson E. Coleman, 624 F Street, Washington, D. C.

INVENT SOMETHING. YOUR IDEAS MAY BRING WEALTH. Free book tells what to invent and how to obtain a patent through our credit system. Talbert & Parker, 4103 Talbert Building, Washington, D. C.

PATENTS.—NO ATTORNEY FEES UNTIL PATENT ALLOWED. Send sketch for free search. Free Books. Fuller & Fuller, Washington, D. C.

PATENTS. R. MORGAN ELLIOTT & CO., Patent Attorneys, Mechanical, Electrical and Chemical Experts, 718-726 Woodward Building, Washington, D. C.

PATENTS—WRITE FOR HOW TO OBTAIN A PATENT, list of Patent Buyers, and Inventions Wanted. $1,000,000 in prizes offered for inventions. Send sketch for free opinion as to patentability. Our **Four Books** sent free upon request. Patents advertised **Free.** We assist inventors to sell their inventions. Victor J. Evans Co., Patent Attys., 755 Ninth, Washington, D. C.

PATENTS SECURED OR FEE RETURNED. ACTUAL SEARCH FREE. Send sketch or model. 1917 Edition 90-page patent book free. My patent sales service gets full value. George P. Kimmel, 12-L Barrister Building, Washington, D. C.

PATENT YOUR IDEAS—$9,000 OFFERED for certain inventions. Books, "How to Obtain a Patent," and "What to Invent," sent free. Send rough sketch for free report as to patentability. Manufacturers constantly writing us for patents we have obtained. We advertise your patent for sale at our expense. Established 20 years. Address Chandlee & Chandlee, Patent Attorneys, 1032 F Street, Washington, D. C.

IDEAS WANTED—Manufacturers are writing for patents procured through me. Four books with list hundreds of inventions wanted sent free. I help you market your invention. Advice Free. R. B. Owen, 71 Owen Bldg., Washington, D. C.

PATENTS SECURED OR FEE RETURNED. Books and advice free. Send sketch for free search. We help market your invention. A. M. Buck & Co., 533 7th Street, Washington, D. C.

AUTHORS—MANUSCRIPTS

WANTED—STORIES, ARTICLES, POEMS FOR NEW MAGAZINE. We pay on acceptance. Handwritten MSS. acceptable. Send MSS. to Woman's National Magazine, Desk 38, Washington, D. C.

WRITE NEWS ITEMS and Short Stories For Pay in spare time. Copyright book and plans free. Press Reporting Syndicate, 435, St. Louis, Mo.

STORIES, POEMS, PLAYS, ETC., ARE WANTED FOR PUBLICATION. Good ideas bring big money. Submit Mss. or write Literary Bureau, 112, Hannibal, Mo.

MOTION PICTURE PLAYS

HUNDREDS OF PEOPLE MAKE BIG MONEY WRITING Photoplays, Stories, Etc.! Why don't you? No correspondence course needed. Experience unnecessary. Write us for free details. Bookmart Co., Dept. 21, Auburn, N. Y.

PHOTOPLAYS WANTED BY 48 COMPANIES; $10 TO $500 EACH PAID FOR PLAYS. No correspondence course or experience needed; details sent free to beginners. Sell your ideas. Producers League, 330 Wainwright, St. Louis, Mo.

STAMPS AND RARE COINS

WILL PAY $2.00 FOR 1904 DOLLAR, PROOF; 10c for 1912 nickels. S. Mint; $100.00 for Dime 1894, S. Mint. We want thousands coins and stamps. We offer up to $1000.00 for certain dates. Send 4c now for our Large Illustrated Coin Circular. Numismatic Bank, Dept. B, Fort Worth, Texas.

PHOTOGRAPHY

"PERFECT PICTURES"—HOW AND WHERE TO GET THEM. Write to-day for this interesting, free booklet. David Stein Company (Everything in Cameras), 1027-1029 W. Madison Street, Chicago, Ill. In Business Since 1885.

PHONOGRAPHS

BUILD YOUR OWN PHONOGRAPH. Save big manufacturing and selling profits. We furnish mechanical parts. You make the rest. Details free. Associated Phonograph Co., Dept. 166, Cincinnati, Ohio.

MUSIC AND SHEET MUSIC

"AMERICA," NATIONAL MEDLEY, "Good-Bye, Mollie May," Song Sheet Music; the two ten cents. Music Composing, Arranging, Printing and Publishing. Harding's Music House, (Established 1860), 228 East 22 Street, New York.

F6

"Don't tell me you never had a chance!

"Four years ago you and I worked at the same desk. We were *both* discontented. Remember the noon we saw the International Correspondence Schools' advertisement? That woke me up. I realized to get ahead I needed special training, and I decided to let the I. C. S. help me. When I marked the coupon I asked you to sign with me. You said, 'Aw, forget it.'

"I made the most of my opportunity and have been climbing ever since. You had the same chance I had, but you turned it down. No, Jim, you can't expect promotion until you've trained yourself to handle bigger work."

There are lots of "Jims" in the world—in stores, factories, railroads, offices, everywhere. Are *you* one of them? Wake up! Every time you see an I. C. S. coupon your chance is staring you in the face. Don't turn it down.

Right now over one hundred thousand men are preparing themselves for better and bigger jobs through I. C. S. courses.

You can join them and get in line for promotion. Mark and mail this coupon, and find out how.

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 5962, Scranton, Pa.

TEAR OUT HERE

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 5962, SCRANTON, PA.

Explain, without obligating me, how I can qualify for the position, or in the subject, *before* which I mark X.

- ☐ LOCOMOTIVE ENGINEER
- ☐ Locomotive Fireman
- ☐ Traveling Engineer
- ☐ Traveling Fireman
- ☐ Air Brake Inspector
- ☐ Air Brake Repairman
- ☐ Round House Foreman
- ☐ Trainmen and Carmen
- ☐ Railway Conductor
- ☐ MECHANICAL ENGINEER
- ☐ Mechanical Draftsman
- ☐ Machine Shop Practice
- ☐ Boiler Maker or Designer
- ☐ Stationary Engineer
- ☐ Gas Engine Operating
- ☐ CIVIL ENGINEER
- ☐ Surveying and Mapping
- ☐ R. R. Constructing
- ☐ Bridge Engineer
- ☐ ARCHITECT
- ☐ Architectural Draftsman
- ☐ Contractor and Builder
- ☐ Structural Engineer
- ☐ Concrete Builder
- ☐ TRAFFIC MANAGER
- ☐ BOOKKEEPER
- ☐ R. R. Agency Accounting
- ☐ R. R. Gen'l Office Acc'ting
- ☐ Higher Accounting
- ☐ Stenographer and Typist
- ☐ Mathematics
- ☐ SALESMANSHIP
- ☐ ADVERTISING
- ☐ Railway Mail Clerk
- ☐ CIVIL SERVICE
- ☐ ELECTRICAL ENGINEER
- ☐ Electrician
- ☐ Electric Wiring
- ☐ Electric Lighting
- ☐ Electric Railways
- ☐ Telegraph Engineer
- ☐ Telephone Work
- ☐ MINE FOREMAN OR ENG'R
- ☐ Metallurgist or Prospector
- ☐ CHEMIST
- ☐ AUTOMOBILE OPERATING
- ☐ Auto Repairing
- ☐ Good English
- ☐ AGRICULTURE
- ☐ Poultry Raising
- ☐ Spanish
- ☐ German
- ☐ French
- ☐ Italian

Name_____

Occupation & Employer_____

Street and No._____

City_____ State_____

DIAMONDS ON EASY PAYMENTS ONLY

LOOK 2.50 A MONTH

$75 Diamond Only $50

NEW DISTRIBUTION PLAN

MEANS A SAVING OF ONE-THIRD of your money. WRITE TODAY, make your Christmas selections NOW.

Perfect cut blue white gems, absolutely GUARANTEED as represented. SEE THESE DIAMONDS FIRST.

Order Now for Christmas

STARTLING OFFER

—explained when you receive the **New Diamond Book** just off the press. Shows many sizes of diamonds, designs of rings and other beautiful pieces of Diamond jewelry. Any Diamond you want to see will be sent without **one penny down. We trust you absolutely.**

Examine diamond all you want to. Wear it **30 Days Free.** Send it back at our expense if you do not want it.

Don't Pay Three or Four Dealers' Profits

We sell "Direct" from diamond cutter to you at practically European prices. Save **one-third** to **one-half** of your money —and our **Great Distribution Offer** means a still greater saving to you.

WEAR THE DIAMOND

all the time. Right from the time you receive it, and our splendid plan makes you the owner and you scarcely miss the money.

Select your diamond from these shown here if you want to

Write for **Free Diamond Book** today. See all the dazzling beauties.

Santa Fe Watch Co.

Dept. D-77, Topeka, Kans.

Be a Finger Print Expert

Police departments, factories and industries everywhere are adopting this system of identification. Experts needed at once. You can train yourself in spare time at home. Write for details.

Free Book—Write Valuable and interesting book on finger prints sent absolutely free and prepaid. Also details of special limited offer. Write at once, while this offer lasts.

EVANS UNIVERSITY, FINGER PRINT DEPT. Desk 1098, 1772 Wilson Avenue, CHICAGO

$4.50 Offer

Only $4.50 down brings you the brand new Rex (*with 10 years' guarantee*) built because world's greatest merchandise house wanted a better machine than any on market. Sent on trial. Typewriter prices smashed! *Write today* for our big free book and our startling offer. Our big illustrated book is an *education in typewriters*. Write for it **now!**

Rex Typewriter Co., Dept. 1099 **LeMoyne Bldg., Chicago**

Does The Socket Chafe Your Stump?

If so, you are NOT wearing **Buchstein's Vulcanized Fiber Limb** which is soothing to your stump, cool, neat, light, weighs not much thicker than a silver dollar, strong.

Guaranteed 5 Years.

Sold on easy payments to good people.

C. Buchstein Co., 113 6th St., S., Minneapolis, Minn.

$500 REWARD

We will pay $500.00 reward to anyone who can permanently dim the brilliancy of the RAJAH Im. diamond without destroying the stone.

RAJAH Im. Diamonds

They stand all diamond tests—fire, acid, file, and glass cutting. Their brilliancy is eternal. Guaranteed for a lifetime. Set in solid gold, and sent to you on **30 Days' Free Trial** If you can tell it from a real diamond return it. Send today for our beautiful, FREE illustrated jewelry catalog in colors. Write now.

KRAUTH & REED, 155 N. State St., Dept. 145 CHICAGO, ILL.

TYPEWRITERS

$10 and up. All makes. Save $25 to $50 on rebuilt at the factory by the well-known "Young Process." Sold for low cash—installment or rented. Rental applies on purchase price. Write for full details and guarantee. Free trial.

YOUNG TYPEWRITER CO., Dept. 412, Chicago

Learn to Write

I can make a good penman of you at home during spare time. Write for my free book "How to Become a Good Penman." It contains specimens and tells how others mastered penmanship by the Tamblyn System. Your name will be elegantly written on a card if you enclose stamp to pay postage.

F. W. TAMBLYN, 410 Ridge Building, Kansas City, Mo.

CIVIL SERVICE

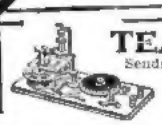
positions are in all parts of the country. Good pay, steady work, life positions, congenial surroundings, promotions on merit, short hours, annual vacation and sick leave with pay. Many thousands appointed yearly. Both sexes. No political pull. Nearly 300,000 classified positions. Common school education sufficient. Full information and questions used by the Civil Service Commission free.

COLUMBIAN CORRESPONDENCE COLLEGE, Washington, D. C.

"THERE'S MONEY IN IT"

AT HOME **LEARN TELEGRAPHY** AT HOME

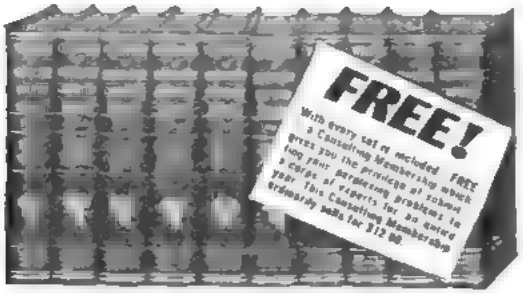
MORSE AND WIRELESS



TEACH YOURSELF in half usual time, at trifling cost, with the wonderful Automatic Transmitter **THE OMNIGRAPH.** Sends unlimited Morse or Continental messages, at any speed, just as an expert operator would. **Adopted by U. S. Gov't, and leading Universities, Colleges and Telegraph Schools. 4 styles. Catalog free.**

OMNIGRAPH MFG. CO., 39-41 Cortlandt St., New York

Pay-Raising Books at Reduced Prices!



Here's your chance to get—**at a bargain price**—a set of books that will fit you for a better job and bigger pay. Yes, and you may pay the bargain price at the rate of **only 50c a week.** But you must act now! The rising cost of paper and binding materials won't permit us to continue this offer indefinitely.

No matter what your occupation, one of the sets listed below is bound to suit your needs. They are written in easily-understood language by recognized authorities, and contain thousands of photographs, full-page plates, diagrams, etc., that make difficult points as simple as A-B-C. Handsomely bound in half or full morocco leather, gold stamped.

Shipped for 7 Days' Free Trial

We'll gladly send any set of books to you for seven days' free examination, shipping charges fully prepaid. Examine them carefully—use them at your work for an entire week. If, at the end of that time, you feel they aren't worth many times what we ask, send them back to us. If you keep them, pay the specially-reduced price on the easy terms explained below.

Practical Home Study Books

	Vols.	Pages	Size of Page	Illus.	Reg. Price	Spec'l Price
Civil Engineering	9	3900	7x10	3000	$45.00	**$29.80**
Architecture, Carpentry and Building	10	4760	7x10	4000	50.00	**24.80**
Accountancy and Business	10	8680	7x10	1987	50.00	**24.80**
Applied Electricity	7	3000	7x10	2600	35.00	**19.80**
Automobile Engineering	5	2400	5½x8¾	2000	25.00	**17.80**
Telephony and Telegraphy	4	1728	7x10	2000	20.00	**12.80**
Modern Shop Practice	6	2300	5½x8¾	2500	30.00	**17.80**
Heating, Plumbing and Sanitation	4	1600	7x10	1600	20.00	**14.00**
Mechanical and Architectural Drawing	4	1720	7x10	1037	20.00	**12.00**
Motion Picture Work	2	600	7x10	300	12.00	**6.00**
Law and Practice with Reading Course	13	6000	7x10	24	72.00	**39.80**

Only 50c a Week

Not only can you buy these books at a rock-bottom price, but we offer them to you on the easiest of monthly payments. If, after seven days' examination, you decide to keep the set you have selected, simply send us $2 and then $2 a month until the present low price has been paid. Have you ever heard of a more generous offer?

Don't wait. This means money in your pocket if you act now. Remember, you take no chances whatever—it costs nothing to inspect and you are not obliged to keep the books if you do not care to buy. This offer is open to every man living within the boundaries of the U. S. and Canada. Mail the coupon **now**—before you turn the page!

AMERICAN TECHNICAL SOCIETY
Dept. X-1099 **CHICAGO, U. S. A.**

SPECIAL DISCOUNT COUPON

American Technical Society, Dept. X-1099, Chicago, U. S. A.

Please send me set of ....

.....

for 7 DAYS ....

NAME .....

ADDRESS .....

REFERENCE .....

In answering this advertisement it is desirable that you mention RAILROAD MAN'S MAGAZINE.

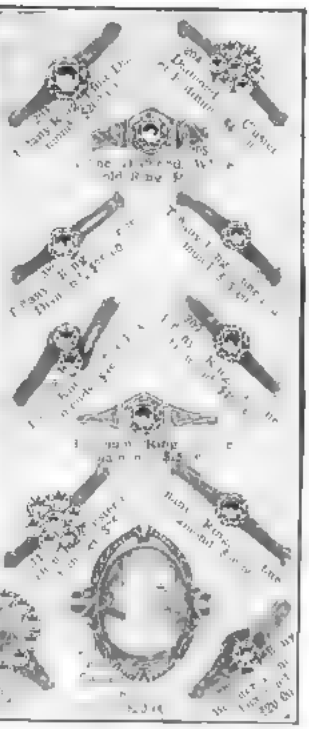
Buy Xmas Gifts Today—Eight Months To Pay

Why pay cash when you can get "Sweet" diamonds and jewelry on credit at cash prices? WE TRUST YOU—no security—no guaranty—no red tape WE TRUST YOU

20% Down 10% Monthly

Free Examination

Anything you select from our complete gift Catalog 2E, will be sent at our expense. *You see before you buy.* Only if you are satisfied do you pay one-fifth down, and the balance in equal monthly payments. "Sweet" diamonds are superior quality, perfect cut blue-white gems.



Our Unusual 7½% Profit Sharing Guarantee

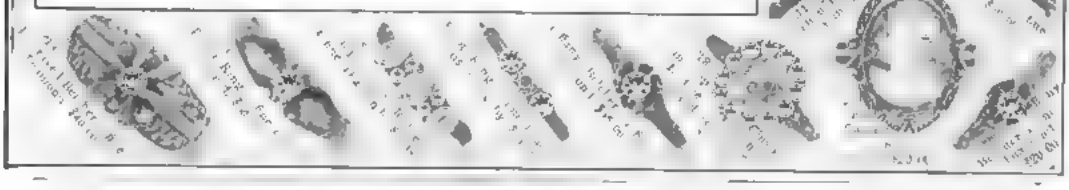
Invest in a "Sweet" diamond. Each gem is guaranteed by us for quality and value. Our binding guarantee protects you.

We accept diamonds bought from us in exchange for larger gems at full price, plus 7½% annual increase

Get Your Copy of Gift Jewelry Catalog 2E Today

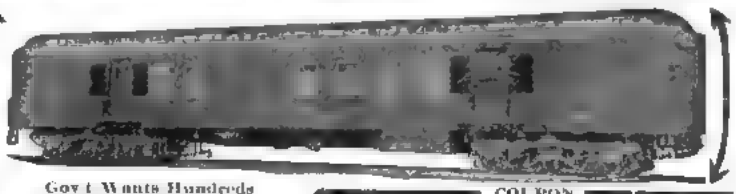
Over one thousand gifts to select from—gifts suitable for everybody. Diamond rings, pins, lavalieres, watches, etc.—silverware—French ivory toilet goods, cut glass—also cameras and phonographs

L. W. SWEET & CO., Inc., 2 & 4 Maiden Lane • 2E • New York City



Make this car your office—

there is $900.00 to $1800.00 a year in it for you



Examinations will likely be held everywhere soon

Govt Wants Hundreds Clerks for War Work

Rapid advancement to higher Government Positions. "No layoffs" because of STRIKES, FINANCIAL FLURRIES or the WHIMS OF SOME PETTY BOSS. THE POSITION IS YOURS FOR LIFE.

Country residents and city residents stand the same chance for immediate appointment. Common sense education sufficient. Politics unnecessary. NO "PULL" REQUIRED.

We will prepare 25 candidates FREE Write immediately for schedule showing the places and dates of all COMING GOVT exam nations. Don't delay. Every day you lose means the loss of just so much coaching before the rapidly approaching examinations

FRANKLIN INSTITUTE, Dept H-101, Rochester, N. Y.

COUPON

Franklin Institute (The pathway to plenty) Dept H-101 Rochester N. Y

This coupon filled out as directed entitles the sender to 1 free specimen question. 2 a free copy of our copyrighted book (Government Positions and How to Get Them). 3 a list of positions now easily obtainable, and 4 to consideration for Free Coaching for the examination here checked

Railway Mail Clerk ($900 to $1800)	Customs Positions ($800 to $1500)
Bookkeeper ..... ($900 to $1800)	Stenographer ..... ($900 to $1500)
Mail Clerk-Carrier ($800 to $1200)	Internal Revenue ($700 to $1800)
Rural Mail Carrier $500 to $1100)	Clerk at Washington ($800 to $1500)

Name..... Address H-101

Use this before you lose it Write plainly

WHITING-ADAMS BRUSHES

Schools, Public Buildings and Residential Buildings Require

Floor Sweeping and Dusting brushes which are made of good quality, stiff, elastic bristles. Sanitation demands that dirt and dust be actually removed. Soft brushes, which mat down, will not serve the purpose.

WHITING-ADAMS FLOOR BRUSHES, DUSTING BRUSHES

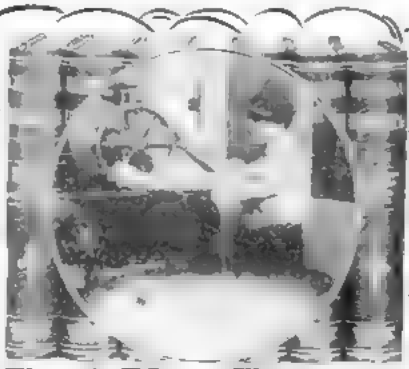
and other brushes for Household, Mechanical and other purposes, do the work as it should be done. Reliable and economical.

Send for Illustrated Literature. Dept-U.

JOHN L. WHITING-J. J. ADAMS COMPANY, Boston, U. S. A. Brush Manufacturers for Over One Hundred Years

Whiting-Adams Brushes Awarded Gold Medal and Official Blue Ribbon, the Highest Award at Panama-Pacific Exposition 1915

F10



Get Up Steam! Be a CHIEF ENGINEER!

Make $125. to $250. Monthly

These wonderful books bring "*the big job*" within reach of every fireman and other engine men. *Get up steam! Study in Spare time!*

This great set of books covers the ground completely. Tells you *how* to get your Chief Engineer's license. Every fact on Steam Engineering at your finger tips.

Steam Engineering

7 Big Volumes Shipped to You FREE

Written by 27 Experts

Seven Volumes, 3,020 pages, 6x9 inches, 2,000 illustrations, full page plates, many of them in colors. Bound in Red Morocco Grain Fabrikoid, title and design stamped in gold and silver. Titles of books and list of subjects treated will be found in the table of contents printed below. Each book contains many valuable rules, tables, data and diagrams. Every subject treated in a clear, concise manner. Written in simple English, easy to understand.

ALL ABOUT

- **Steam Boilers**
  - Construction
  - Types
  - Practice
  - Accessories
  - Furnaces
- **Steam Engines**
  - Steeplegear
  - Marine
  - Indicators
  - Valve Gears
- **Locomotive**
  - Boilers
  - Engines
  - Air Brakes
  - Steam Turbines
- **Gas Engines**
- **Oil Engines**
- **Gas-Producers**
  - Producer Plants
  - Combustion
  - Heating
  - Natural Gas
  - Electricity
  - Hydraulic
  - Electric
- **Compressed Air**
  - Machinery
  - Refrigeration
  - Ice Plants
  - Cold Storage
- **Generators**
- **Motors**
  - Management
  - Power Stations

50c a Week

We will ship the entire seven volumes direct from our own home office to your home for the small sum of 50c a week. Just send the coupon and the books will be sent at once. If you are not entirely satisfied after examining them for ten days, return them at our expense. If you keep the books, pay us only $2 a month until the special price of $24.80 is paid. Send no money—just the coupon. Act quick, before the present edition is exhausted. Only a limited number of sets at this price.

SEND NO MONEY—JUST THE COUPON

AMERICAN TECHNICAL SOCIETY

CHICAGO, U. S. A.

Dept. S1099

Please send me the Seven volume set of the Cyclopedia of Steam Engineering for ten days free examination. If I keep the books, I will pay you $2 a month until the special price of $24.80 is paid. If I do not keep them I will return them at your expense. (This offer has been made possible by the fact that a number of sets were returned after the publishers had sold the entire edition. These sets were taken back by the publishers in part payment for the new sets we are now selling. Although slightly used, they are in perfect condition and will be sent at the same prices and terms as the new sets. Only a limited number of sets are available.)

Name .....

Address .....

Reference .....

Signal Flannel Shirts

For Winter Wear

You will have no dread of the cold weather if you wear a *Signal Flannel Shirt*. It will keep you warm even in zero weather. Made of the finest flannel. Every seam—every button—every buttonhole is doubly strong and the whole garment is extremely serviceable. Comes with plain or military collar.

Signal Flannel Shirts

Closed or Coat Style

are stylish and have many comfort features not found in other shirts and you get your choice of many new, different, original styles. They have always been popular with railroad men because of their warmth, good appearance and long wear.

Order From Your Dealer

Most dealers sell *Signal Flannel Shirts*. If yours doesn't send us his name and address and we will send him a sample shirt for your inspection. If you do not like it you are not bound to buy.

Hilker-Wiechers Mfg. Co.

Dept. A—1252 Mound Ave., Racine, Wis.

Makers of THE TRIPLE TEST SIGNAL SHIRT the Famous OVERALLS

Always look for this Trade-Mark—

it's the "Safety First" sign on buying Shirts

Diamonds and Tifnites

"As Like as Two Peas"

See these wonderful Tifnite Gems sent direct on our special Free Wear offer. Wear it on your finger and say that you and we are right. Tifnites have the pure white color and the flash and fire of the diamond. Stand a diamond tests fire, acid and diamond file. No backing, no paste, no foil, but pure and sparkle. Only an expert can distinguish between them and you or they cost us $100 Don't miss this great offer. Send the coupon now and we will send you your choice of these three superb rings as our pin to wear free for ten days. Send no money. Just the coupon now while the special offer holds good.

Post Bracelet Ring

No. 1. Solid gold ring, Eight claw setting with flat wide band. A most attractive ring. Tifnite Gem $3 on approval. Price $3 on arrival. Balance $3 per month.

Solid Gold Mounting

Every Tifnite Gem is set in the most fashionable, most artistic mountings. Rich, solid gold. Send the coupon and see for yourself what wonderful gems these are.

FREE!

For 10 Days' Wear

Ladies' Ring

No. 2. Solid gold Tifnite Gem mounted in a handsome ring. Tifnite Gem a most beautiful imitation of the diamond. Guaranteed to stand acid and file tests. Price $3 on approval. $3 on arrival. Balance $3 per month.

Scarf Pin

No. 3. Solid gold, French design. Tifnite Gem. Price $3 on approval. $3 on arrival. Balance $3 a month.

Secure the ring you want on free approval coupon. We will send only $3.00 on arrival. Wear it 10 days. If fully satisfied pay balance $3 a month. If not satisfied return the ring or pin to us and we will refund any money you have paid. You risk nothing by accepting this offer. So send while it holds good.

Send No Money

Neither money nor references. Just the coupon brings wonderful Tifnite Gem on approval. Solid gold mounting. Pay $3.00 on arrival and balance $3 a month. Send a strip of heavy paper so that when you measure which finger you wish to wear ring. Don't let it slip. Send the coupon. Send now and take advantage of this liberal free trial offer. Satisfy yourself about these dazzling gems.

Tooth Brace Ring

No. 4. Solid gold ring, strong tooth effect. Guaranteed to stand Tifnite Gem a most beautiful imitation of the diamond. Price $3 on approval. $3 on arrival. Only $3.00 per month.

THE TIFNITE GEM CO
Rand McNally Bldg., Dept. 279 Chicago

Send me ..... No. ..... on 10 Days' approval. If satisfactory, I agree to pay $3.00 on arrival and balance at rate of $3.00 per month. If not satisfactory, I will return same within 10 days.

Name .....

Address .....

Mr. A. R. Patterson, whose advertisement appears below, was for eight years a Civil Service Secretary Examiner and is well qualified to help YOU secure a Government Position.

WANTED! MEN FOR CIVIL SERVICE

Send for Free Book

By Working for Uncle Sam, Show Your Patriotism

Men 18 to 50 are needed at once for the Railway Mail Service, Postal Service, Customs Service, Internal Revenue Service, Departmental Service, Panama Canal Service, etc. Thousands of appointments will be made during the coming year. Many places pay $1,000 to $1,800 a year to start, with chances for promotion. Steady work. Short hours. Vacations with full pay. Pleasant surroundings. Many chances for travel. Common education sufficient. Political influence unnecessary. Write immediately for free list of positions now obtainable. Sign and mail coupon today sure.

RAILWAY MAIL CLERK, POSTAL CLERK, REVENUE OFFICER, CUSTOMS SERVICE

and many other positions in the Government Service open to men and women. Thousands of appointments will be made during the coming year. Many places pay $1,000 to $1,800 a year to start, with chances for promotion. Steady work. Short hours. Vacations with full pay. Pleasant surroundings. Many chances for travel. Common education sufficient. Political influence unnecessary. Write immediately for free list of positions now obtainable. Sign and mail coupon today sure.

NEW BOOK FREE!

Mr. Patterson was for 8 years Civil Service Secretary examining applicants for positions in the Railway Mail Service, Postal Service, Internal Revenue Service, Panama Canal Service, etc. He knows exactly what kind of men the Government wants. He knows how to get one. Write him today NOW for free Book and 32-page Civil Service Booklet. Both sent free. Address

PATTERSON CIVIL SERVICE SCHOOL
512 News Bldg., Rochester, N. Y.

NO JOKE TO BE DEAF

—Every Deaf Person Knows That

I make myself hear after being deaf for 25 years with these Artificial Ear Drums. I wear them day and night. They are perfectly comfortable. No one sees them. Write me and I will tell you a true story how I got deaf and how I make you hear. Address

Medicated Ear Drum Pat. Nov. 3, 1908

GEO. P. WAY, Artificial Ear Drum Co. (Inc.)
121 Adelaide St. Detroit, Mich.

DEXTER Penmanship TAUGHT BY MAIL IN YOUR OWN HOME

free of charge if you are interested in

Shorthand, Bookkeeping or English

For full particulars and samples of fine penmanship, address

TEVIS & JACKSON - - CHILLICOTHE, MO.

LESS THAN ½ PRICE

On New $100 Underwood

I am a rebuilder of Underwood Typewriters and have ... I have saved you ... NEW Underwood ... $100 ... I guarantee ... YEARS ... Write for ... E. W. S. Shipman, Pres., Typewriter Emporium
34-36 West Lake Street, Chicago, Ill.

Wrestling Book FREE

Learn to be an expert wrestler. Know scientific wrestling, self-defense and jiu-jitsu. Develop a splendid physique and get perfect health. Our pupils are learning by mail. The famous Gotch-Hackenschmidt-Farmer Burns system. Guarantee. Write today for free book.

Frank Gotch and Farmer Burns

offer you a wonderful opportunity. Wrestling is easily and quickly learned at home by mail. Men and boys write now for splendid free book. Learn all the science and tricks to be able to handle big men with ease. Accept this wonderful offer NOW. Send for free book today, stating your age.

Farmer Burns School of Wrestling, 1099 Barker Bldg., Omaha, Neb.

This NEW ELGIN

ON 30 DAYS FREE TRIAL

Adjusted

17 Jewel Elgin

This New Thin Model 17 Jewel Elgin is absolutely supreme where Reliability is a factor. Double sunk dial—Double Roller Escapement—Double strata 25 year Gold case. It's just the watch you've always wanted.

Send No Money! **$1.50 —A— MONTH**

Easy Credit Terms As Low As

Just send your name and address for this New Elgin with our Special $5 Gold Chain Free, and our bed-rock confidential price will surprise and delight you.

Sent on Approval You do not risk a cent. We send this Watch and $5 Chain complete on your own approval—also our 160 page ***FREE CATALOG***, showing all kinds of Watches, Diamonds, etc., all on smilingly easy terms. ***Send your name and address today.***

The House That Sells More Elgin Watches Than Any Other Firm in the World

HARRIS-GOAR CO., Dept. 222 **KANSAS CITY, MO.**

WE DO AS WE ADVERTISE!

WANTED-IDEAS

MANUFACTURERS

are constantly writing me for new ideas protected by

OWEN PATENTS

Send for my free literature and read their wants

FREE! Four finest patent books published! 72-page guide "Successful Patents;" "Stepping Stones" (containing list of over 300 inventions wanted; tells the plain truth about prizes, reward offers, etc.) and "Patent Promotion" (tells how to sell your rights; chief causes of failure, etc.) "Patent Buyers" (publishes over 400 letters from those who desire to buy Owen Patents). All sent *free upon request.*

Very highest references. I help my clients sell their patents or dispose of their applications. Advice free. No obligation incurred by writing me. Free manufacturing facilities. No charge for report as to patentability, practicability, etc.

RICHARD B. OWEN

71 Owen Building, Washington, D. C.

High School Course in Two Years!

Here's a thorough, complete, simplified High School Course that you can complete in **two years.** A Liberal Education of incalculable value, by spare time study at home. Course prepared by leading professors in Universities and Academies

Meets Entrance Requirements of Colleges and Universities

Fitted for Harvard, Yale, Princeton and other institutions of higher learning. Has won many scholarships. Meets the State requirements for admission to the bar. Also the study of [illegible] **"Knowledge is POWER"**

This man who **knows** is the **leader.** Knowledge gives you self-confidence, develops your **natural ability** into actual power. This course gives you the **key to success and power**

Don't Stop Growing

Keep on going! Train your brain! Broaden your vision! Make the most of your life **before too late.** Cash in on your natural ability!

Choice of 20 Courses

We have helped 30,000 men and women to win. Let us help **you,** too

Send coupon today for FREE Book and Full Information

YOU Can Make Up for Lost Time!

Men and women who have had only a common school education, but who have studied with the American School, have qualified for better positions and increased salaries. Thousands have profited by this remarkable opportunity

American School of Correspondence, Chicago, U.S.A.

Dept. P1000 Chicago. Please send me booklet and tell me how I can [illegible] for the position marked "X"

.. High School Course	.. Lawyer
....Electrical Engineer	.. Business Manager
... Telephone Engineer	. Auditor
... Architect	Certified Public Accountant
.. Building Contractor	....Stenographer
.. Structural Engineer	... Bookkeeper
.. Mechanical Engineer	... Fire Ins. Adjuster
.. Civil Engineer	....Sanitary Engineer
.. Steam Engineer	Automobile Engineer
Shop Superintendent	

NAME ... .

ADDRESS ... .

Good News for Story Lovers

A great big magazine every
seven days

THE ARGOSY

is now

ISSUED WEEKLY

Bigger and better than ever and still only

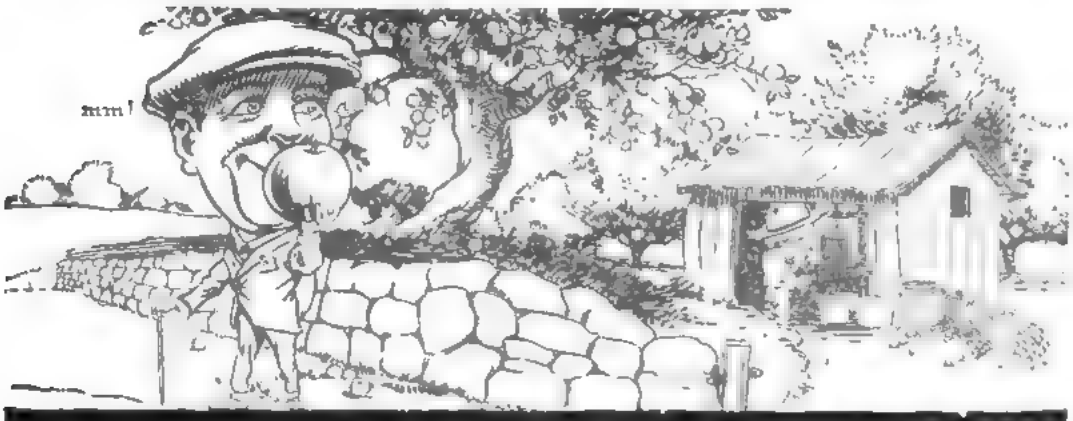
TEN CENTS A COPY

Get a number at your news-stand and look it over. Crackerjack stories in every variety

Complete Novels ***Serials***
Short Stories ***Fiction that fascinates***

Always something new, something clever, something bright. The Argosy is the oldest of the all-fiction magazines and yet keeps perennially young. Buy it and judge for yourself.

The Frank A. Munsey Company
8 West Fortieth Street
New York



HOW do you know it's Apple season?

"Your Nose Knows"

By the appealing *Fragrance* of ripened fruit. Nature labels her most particular products with *pure fragrance* -to guide you to her best. Sight, sound, taste, touch, often deceive—pure fragrance *never*. Depend upon it. Trust it—"Your Nose Knows." The *pure fragrance* of a fine tobacco is Nature's infallible guarantee of smoke satisfaction—a guarantee to *you* personally, and—"Your Nose Knows."

Such a guarantee you will find in

Tuxedo

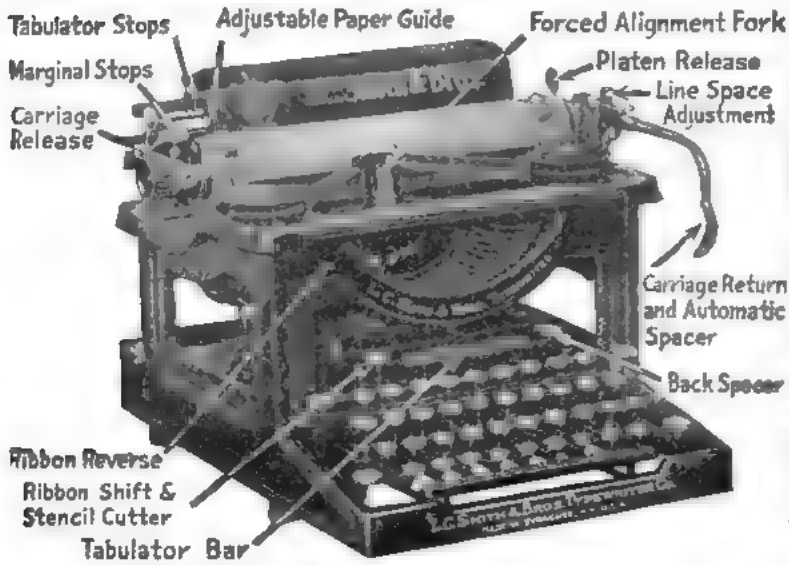
The Perfect Tobacco for Pipe and Cigarette

Blue Grass sunshine and the soil of Old Kentucky give the blended Burley leaves of Tuxedo that rich, *pure fragrance* which is so appealing, so satisfying. There is no fragrance like it—"Your Nose Knows."

Try this Test:—Rub a little Tuxedo briskly in the palm of your hand to bring out its full aroma. Then smell it deep—its delicious *pure fragrance* will convince you. Try this test with any other tobacco and we will let Tuxedo stand or fall on your judgment

"Your Nose Knows"

Guaranteed by
The American Tobacco Co.
INCORPORATED



I want through this advertisement, to establish as friendly a business relationship with you as I possibly can. I want you to realize also, that it is my earnest effort and intention to give you full value for every dollar you send me. This is the only way I can succeed. My advertisement has appeared in this magazine continuously for more than four years.

I am building up my business on the foundation of good value and quarter dollars. I am saving thousands of satisfied customers thousands of dollars, by supplying perfect duplicate style visible typewriters, at remarkably low prices.

All my transactions are handled throughout by personal correspondence. I assure every courtesy and consideration, my dealings with me I know would have my prompt, careful, personal attention. I will be glad to do business with you.

Harry A Smith

ALL LATEST IMPROVEMENTS

TYPEWRITER SENSATION

Free TRIAL—Use As You Pay

Send me only $2.50 a month until the low total price of $48.80 is paid, and the machine is yours

This is absolutely the most generous typewriter offer ever made. Do not rent a machine when you can pay $2.50 a month and own one. Think of it. Buying a $100.00 machine for $48.80. Cash price, $45.45. Never before has anything like this been attempted.

STANDARD VISIBLE L. C. SMITH

Perfect machines, standard size, keyboard of standard universal arrangement—universally used in teaching the touch system. The entire line of writing completely visible at all times, has the tabulator with adjusting devices, the two color ribbon—with automatic reverse and key controlled shift, automatic flexible paper feed, automatic paper fingers, the back spacer, ball bearing carriage action, ball bearing shift action—ball bearing type bars—in fact, every late style feature and modern operating convenience. Comes to you with everything complete, tools, cover, operating book and instructions, ribbon, practice paper—nothing extra to buy. **You cannot imagine the perfection of this beautiful reconstructed typewriter until you have seen it.** I have sold several thousand of these perfect latest style L. C. Smith machines at this bargain price and every one of these thousands of satisfied customers had this beautiful strictly up-to-date machine on five days' free trial before deciding to buy it. I will send it to you F. O. B. Chicago for five days' free trial. If you, yourself, but if you are not satisfied that this is the greatest typewriter you ever saw, you can return it at my expense. You won't want to return it after you try it—**you cannot equal this wonderful value anywhere.**

You Take No Risk—Put In Your Order *Now*

When the typewriter arrives deposit with the express agent $8.80 and take the machine for five days trial. If you are convinced that it is the best typewriter you ever saw, keep it and send me $2.50 a month until the bargain price of $48.80 is paid. If you don't want it, return it to the express agent, receive your $8.80 and return the machine to me. I will pay the return express charges. **This machine is guaranteed just as if you paid $100.00 for it.** It is standard. Over one hundred thousand people own and use these typewriters and take them the best ever manufactured.

The supply at this price is very limited, the price will probably be raised when my next advertisement appears, so don't delay. Fill in the coupon today, mail to me, the typewriter will be shipped promptly. There is no red tape. I employ no solicitors, no collectors, no chattel mortgage. It is simply understood that I retain title to the machine until the full $48.80 is paid. You cannot lose. It is the greatest typewriter opportunity you will ever have. Do not send me one cent. Get the coupon in the mails today—sure.

Harry A. Smith 318-231 N. Fifth Ave. Chicago

H. A. SMITH
Room 318-231 N. Fifth Ave.
CHICAGO, ILL.

Ship me the L. C. Smith F. O. B. Chicago, as described in this advertisement. I will pay you the $40.00 balance of the SPECIAL $48.80 purchase price at the rate of $2.50 per month. The title to remain in you until fully paid for. It is understood that I have five days in which to examine and try the typewriter. If I choose not to keep it, I will carefully repack it and return it to the express agent. It is understood that you give the standard guarantee for one year.

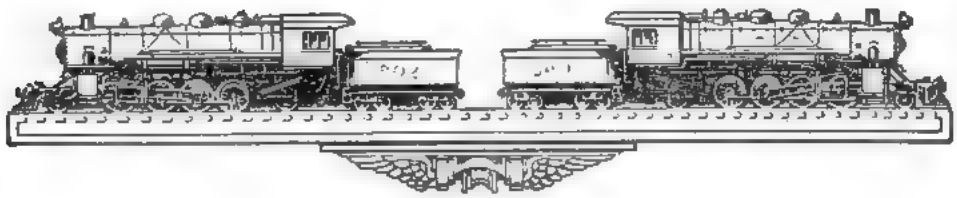
Name .....

Address .....

.....

RAILROAD MAN'S MAGAZINE

Vol. XXXIV. DECEMBER, 1917. No. 4



BUILDING BIG BUSINESS ON BRAINS.

General Electric Has a $300,000 "Science Factory" in Which a Staff of 241 Does Nothing But Scout Around for New Ideas.

BY CHARLES FREDERICK CARTER,

Author of "When Railroads Were New."

ON the right of the main entrance to the Schenectady works of the General Electric Company stands a plain, seven-story, red-brick building that, for any clue its external appearance affords, might serve almost any purpose, but which actually does contain that which should cause you to take off your hat and kowtow respectfully—once to the contents, and twice more to the idea represented.

For this building is a warehouse for brains, although it is better known among its familiars as the "Research Laboratory," and it was erected as a monument to the corporation's faith in intellect as an investment.

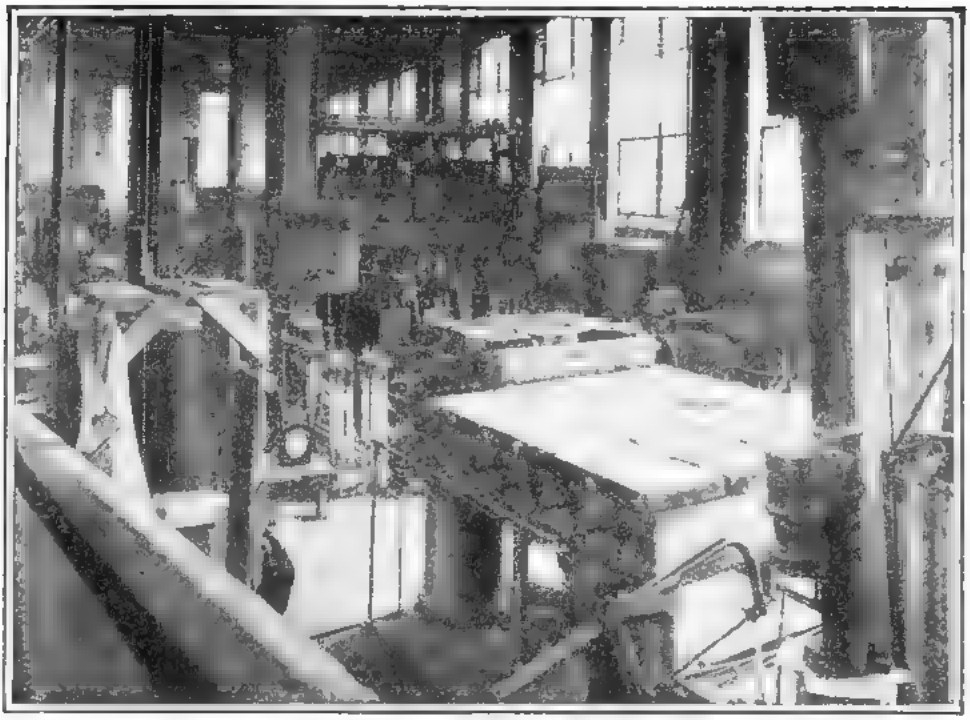
Gray Matter a Good Buy.

So far as this country is concerned the General Electric Company was the first corporation to discover that brains was a good buy. Which is to say, it was first to perceive that science and industry were soulmates, first to call in a bunch of highbrows to make the twain one.

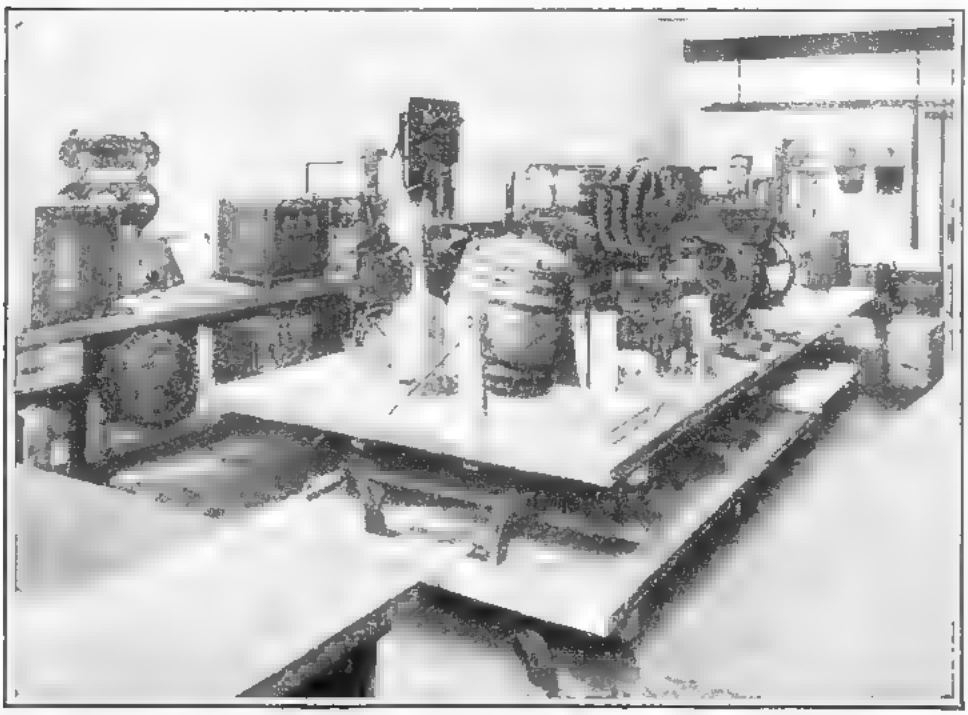
So long ago that the memory of man runneth not to the contrary the company engaged Dr. Charles P. Steinmetz, whose name is included in any trustworthy list of men eminent in electrical discovery, as consulting electrical engineer, not to perform any dreary round of perfunctory duties, but to find out some of the many, many things that were not known about electricity.

This being rather a large contract for one man, Dr. Steinmetz, in due time, was given assistance; and the experiment proving profitable, by a natural process of evolution developed into the idea that a permanent staff of scientific workers for general research would be still more worth while.

Dr. Willis Rodney Whitney, then teaching at the Massachusetts Institute of Tech-



HEAT PLAYS A STAR PART IN RESEARCH, SO A ONE-STORY ADDITION TO THE LABORATORY WAS BUILT ESPECIALLY TO HOUSE A NUMBER OF THE FURNACES USED IN THE VARIOUS PROCESSES



IN THIS ROOM SOME OF THE INTRICATE PROBLEMS IN INSULATION ARE WORKED OUT TO THE LAST DEGREE OF EXACTITUDE

nology for a salary no larger than it should have been, and devoting all the time he could spare to an investigation of colloids, was engaged in 1901 as director of the proposed Research Laboratory.

So little was the world of brilliant possibilities about to unfold before them understood or appreciated that Dr. Whitney stipulated, and the company agreed, that he should make it a half-time job in order that he might continue his teaching and his puttering with colloids, which then seemed more important.

Not until after three years of this half-time, half-hearted, arrangement had elapsed did the parties thereto realize that they had been asleep at the switch.

Science Soon Was Spelled "$cience."

Progress thereafter was swift. As the scientific staff was increased, the revenue-producing results of its labors kept pace so uniformly that the fact soon became apparent that scientific research was just a simple proposition in arithmetic: so many ounces of brains multiplied by so many dollars in salaries equals so much in dividends.

Thereupon the company put up and equipped the seven-story building already mentioned at a cost of $300,000, installed the scientific staff therein, and intimated that it might go as far as it liked.

Now the staff consists of a director and assistant director, 17 physicists and chemists, 6 metallurgists, 28 assistants, 93 helpers, 15 glass-blowers, 69 mechanics, and an office force of 13; total, 241. Between them they get away with a very large wad of the company's money in a year; but the things they do with it are wonderful. As Dr. Whitney has put it:

"The varied interests of the General Electric Company have made complex intercooperation possible between widely diversified needs and equally diversified lines of knowledge. I find on a rough survey that we have worked in some way on such a long list of subjects that even the list itself is tiresome.

"It extends from paints, oils, and varnishes, to irons, steels, and alloys; from the production of copper and zinc to molybdenum and magnesium; from thermions in pliotrons to X-rays in beetles; from carbon and tungsten incandescents to luminous arcs and search-lights; from the mica in the commutator of a railway motor and the brush that wears it away, to the electric solder on the bars and the insulation on the wires; from the composition of the turbine blade to the corrosive action of the boiler feed-water; from atomic hydrogen in lamps to molecular layers in catalyzers; from silicon in transformer iron to silica in fuse fillers; in elements, from lithium and boron to uranium and thorium; in substitutes for rubber and for platinum, in the insulating body of the aero magneto and the contact of the automobile vibrator; from sherardizing to calorizing; and from condenser and boiler tubes to special pyrometer tubes; and always, through prosaic past experience to the exciting new outcome."

As Full of Machinery as a Submarine.

The basement of the building in which all these bewildering achievements have been recorded is stuffed as full of machinery as a submarine; for a research laboratory must not only be equipped to perform all the manifold operations and processes the most revolutionary experimenter may make up his mind to undertake, but it must also be ready at a moment's notice to do any of the things that he might want to try if he thought of them.

In any case, he may want to use an electric current of some sort, though heaven itself only knows what one of the infinite varieties he may select; so here in the basement are sixteen machines which with the neighborly help of one of the transformers stand ready to supply power at any frequency from 25 up to 2,000 cycles, any voltage up to 200,000, any volume up to 12,000 amperes. If you don't see what you want, ask for it.

Whatever is required is delivered wherever it is wanted, or at least to any one of 118 different points in the laboratory through the medium of a transfer switchboard of 28 panels and 35 miles of wire.

Should the experimenter call for air, this accomplished basement stands ready to fill his order at any pressure within reason from a compressor always running during

working-hours. Or, if he takes his air in liquid form, here is a machine producing daily 5 gallons of the coldest liquid known to man

Most of this output of liquid air is used in exhausting the gases from Coolidge X-ray tubes which are manufactured on the eight feet wide and five feet high over each corridor.

And even at that the basement apparatus and the ducts fall so far short of supplying the infinite variety of the experimenters' wants that it was necessary to distribute throughout the building no fewer than 250

EXPERIMENTS WITH VACUUM TUBES ARE CONDUCTED HERE.

premises and extensively used in experiments; but there is always a supply of the liquid available for experiments at low temperatures.

If the experimenter wants air taken away, there is perfectly good vacuum always on tap from a pump in the basement.

Can Turn On Four Kinds of Water.

Every workroom in the laboratory also has on tap hydrogen at high pressure and hydrogen at low pressure; oxygen; high-pressure steam and illuminating gas. As for water, to each room is piped city water, river water, distilled water, and just plain water.

So many things are delivered in such a variety of forms to such a number of places throughout the building that merely to hold the wires and pipes a duct is required motors, 80 transformers, and 60 vacuum pumps.

Heat plays a star part in research; so a one-story addition to the laboratory was constructed to house a number of furnaces, including a porcelain kiln, a frit furnace, two pot furnaces, three calorizing furnaces, two brush firing furnaces, all gas heated, and two large vacuum furnaces electrically heated.

And there are a number of electric furnaces of large size in another building.

There is also a furnace for argon purification. It seems that we have been breathing argon all these years and never knew it until Lord Rayleigh put us next, late in 1914.

Argon forms less than one per cent of the atmosphere, but it is there just the same.

It appears that Lord Rayleigh, in the

course of an investigation discovered a slight difference in the density of nitrogen taken from air and nitrogen derived from other sources.

He felt obliged to know about this; so, collaborating with Sir William Ramsay, he followed up the clue until argon, which is always present in atmospheric nitrogen, but had hitherto escaped detection, was run down and captured.

Finding a Use for Argon.

At first the discovery seemed utterly useless, for argon is entirely inert and chemically inactive. At that time it was also exceedingly difficult to separate from air; and except for its scientific interest, it seemed destined to be left alone.

But newly discovered methods of liquefying air and of combining nitrogen for fertilizer have made argon available commercially.

When something new is discovered it is up to research laboratories to find a use for it; that is what research laboratories are for. Other scientific research had already demonstrated the value of just such a gas as argon in incandescent lamps; so the next step was to find the practicable way to combine the new-found gas with the use awaiting it.

The result is the most efficient incandescent lamp that has yet been produced. The lamp was made possible by the discovery of the difference between argon and other gases.

The calorizing furnace is an interesting evidence of one of the many important discoveries made at the research laboratory. Ever since the close of the bronze age iron has been used for ovens, utensils, and tools of every kind for all temperatures up to red heat; but for higher temperatures no cheap metal has been available. Platinum, because of its cost, has been limited in its application, while cheaper metals, like copper and most of the alloys, such as brasses and bronzes, will not withstand heating in the air to red heat.

T. Van Aller discovered a process of heating metals in revolving drums with mixtures containing among other things finely divided aluminum, by which a surface alloy containing aluminum was produced, that enabled copper, iron and steel to withstand high temperatures without scaling. This process, called "calorizing," was used to some extent, but it had not reached the commercial stage.

The research laboratory took it up and found that pieces which because of their shape or size could not be put in the tumbling barrel could be calorized simply by packing them in a suitable mixture and heating them.

The size of the heater is the only limitation on the size of the piece that may be calorized. Wire or metal ribbon may be treated by a continuous process by passing it through a heated pipe containing the calorizing mixture.

The world now had something valuable; for there are many places in which it is desirable to use iron vessels or apparatus at temperatures above red heat, at which iron rapidly oxidizes and scales away. But after calorizing, the effect of heating on iron is slight. Instead of burning and the scale falling off, as in the case of untreated iron, practically no effect can be detected even by the most careful search.

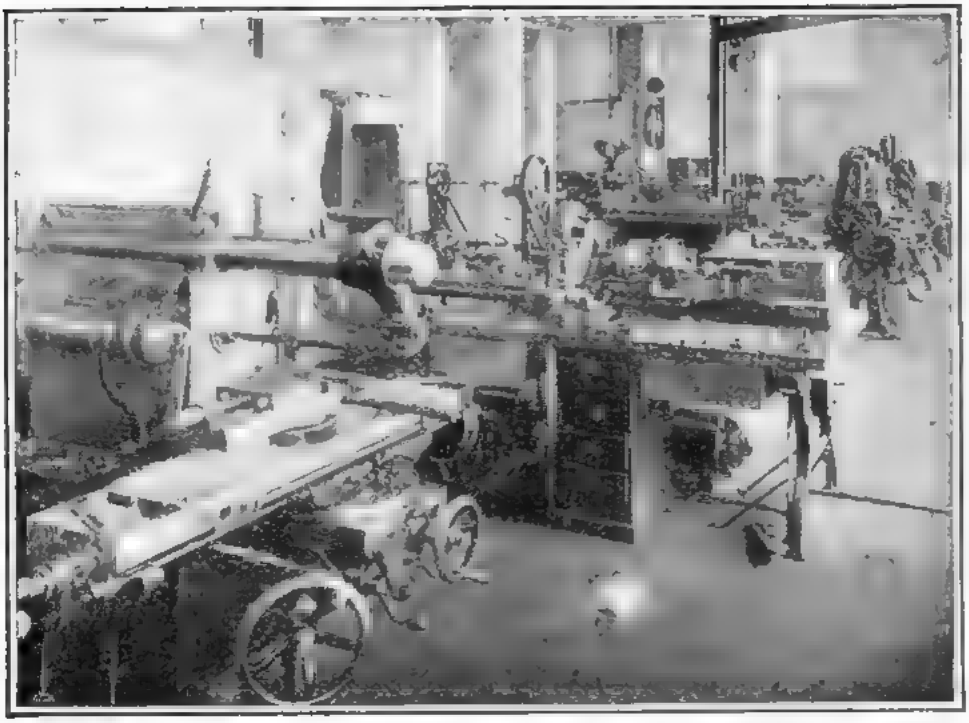
A practical application of this discovery is to iron wire or ribbon such as is used in electrical heating units. An untreated piece of ribbon will burn out in four or five hours at the most. Calorized ribbon has been used at a temperature of 800 degrees Centigrade for more than five hundred hours without being destroyed.

Railway Controller Contacts' Life Doubled.

Calorization of copper has shown equally successful results. A set of railway controller contacts that had been calorized lasted twice as long as those of untreated copper

For iron calorizing is intended only for protection at high temperatures. It does not compete with galvanizing, sherardizing, or similar processes for protection against oxidation or corrosion at low temperatures.

This action of a thin coat of alumina on the surface preventing the iron from burning is explained by the curious property which pure aluminum has of being able to withstand heating in the air to a tempera-



IN THE MACHINE SHOP TOOLS AND DEVICES NOT DREAMED OF IN OUR PHILOSOPHY ARE MADE FOR EXPERIMENTAL PURPOSES.

ture several hundred degrees above its melting point without flowing, when the thin alumina shell which surrounds and supports the molten metal is easily seen.

X Ray Tube Is Improved.

Researches into the properties of tungsten and molybdenum, enumerated by Dr. Whitney as some of the things done by the laboratory, enabled Dr. W. D. Coolidge, a member of the staff, to produce a greatly improved X-ray tube, which runs on a pure electron discharge, and which differs from the tubes hitherto made in the sharpness of focus obtainable, and the complete control by the operator of intensity and penetration, so that no fluorescence and no local heating occur.

All this means a material increase in the usefulness of the X-ray; for as soon as a new tool is perfected, new uses for it are found.

On the second floor of the laboratory is a little manufactory where some of the expert glass-blowers attached to the staff make Coolidge X-ray tubes. On the floor below are three experimental rooms set aside for X ray investigations, which have been prolific in results

Some months ago there was received at the Schenectady works a steel casting two and a half inches thick, and weighing about a ton, that was like some people: it presented a smooth front, but its character would not bear investigation. When this casting had been machined down almost to the desired shape and thickness, small imperfections extending over an area about five inches long and an inch and a half wide were uncovered. The casting was taken out of the machine and sent over to the laboratory to see whether it had any character at all.

Photographing Sub-Surface Holes.

The suspect was stood up vertically in front of an 8 by 10 photographic plate, made specially for X-ray work, back of which was a sheet of lead. A Coolidge tube was placed 20 inches from the casting and a current of 1.25 milliamperes of high voltage was turned on for two minutes.

Several radiographs were taken of various

parts of the finished casting where it was about nine-sixteenths of an inch thick. All the radiographs showed plainly the tool-marks on the surface of the casting.

All but one showed markings suggestive of nimbus clouds and of a shape that indicated that they were pictures of holes in the interior. As a surgeon would say, "It was decided to confirm the diagnosis by making an exploratory incision."

Accordingly a circular piece one inch in diameter was punched from the casting at a point where one of the radiographs indicated that a hole would be found. They found the hole all right.

This was such a promising lead that it was promptly followed up by an exhaustive series of experiments to ascertain just what could be done. The current in the X-ray tube was varied in different ways, and pieces of steel up to an inch and a half thick were radiographed. Artificial grooves were cut in steel to imitate blow-holes and various welds were tried. One radiograph showed a hole in the center of a weld, proving that the metal had not been thoroughly fused. Another indicated a porous structure, which was verified upon machining.

The net result of it all was to establish the fact that radiographs do give valuable information regarding the presence of blow-holes, slag inclusions, porous spots, and similar defects that could not otherwise be found except by cutting into the metal.

For the present this method of testing steel is a commercial possibility only for metal up to half an inch thick.

Are Perfect Steel Rails Coming?

But even this is a promising beginning, which is all the more encouraging in connection with the assertion that "it seems probable that a further increase in the voltage across the tube would allow one to radiograph still greater thicknesses of steel."

Perhaps the time may come when an X-ray apparatus of further improved form may be a part of the standard equipment of steel mills to determine just how much of an ingot shall be cropped to eliminate pipes and blow-holes, yet not waste any sound metal. Does this mean perfect steel rails at last?

Further experiments in the radiography of metals demonstrated that the new Coolidge tube was just as successful in the case of cast copper as it had been with steel. Speaking of copper brings out the interesting fact that here is one of the points at which results of laboratory work double up.

Formerly copper could not be cast successfully, the casting being full of pores and blow-holes, which rendered it about as valuable mechanically as a sponge and useless as an electrical conductor. Various attempts to get rid of the gases that cause these blow-holes by adding deoxidizing ingredients failed because, for one thing, such large quantities had to be used that the castings were of little value as electrical conductors; and one of the most important uses of copper is in electrical work.

Boron for Copper-Casting.

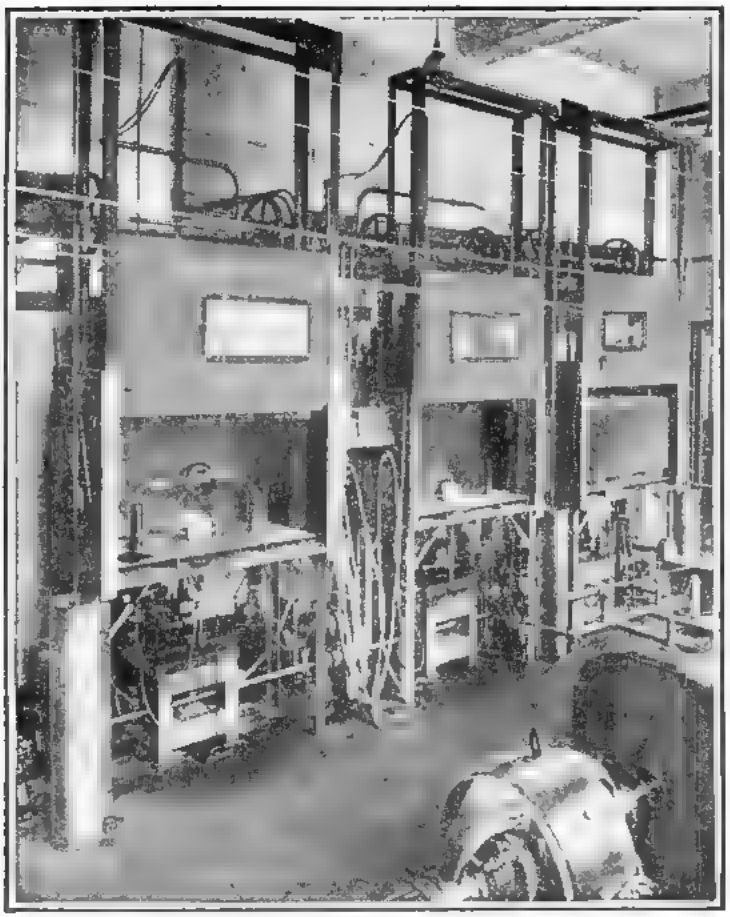
To a concern manufacturing electrical apparatus on an immense scale, the ability to make good copper castings would be of great value. So Dr. Weintraub, one of the laboratory staff, set out on a still hunt to find a way to turn the trick.

In due time he picked on boron, one of the non-metallic elements, which occurs abundantly in combination with other elements, particularly in volcanic regions, as a promising lead; and stuck to it until the promise was fulfilled, good measure, heaped up and running over.

Now tons of copper are being cast that is perfectly homogeneous and entirely satisfactory as an electrical conductor by the use of boron sub-oxid or boron carbid.

After this method of casting copper had been perfected, the laboratory's new X ray tube was called in as a character witness to give the new product a testimonial before it was sent over to the factory to begin a long career of usefulness. Two copper castings were made, one in the usual way, another of the same size treated with one per cent of boron.

The two were placed side by side on the same photographic plate and X-rayed at the same time. The old-fashioned casting gave a radiograph that could have passed as a photograph of a sponge; the boronized casting was solid black.



IN THESE OVENS AIR IS EXHAUSTED FROM THE NEW STYLE COOLIDGE X-RAY TUBES.

The radiographs were verified by machining the castings. The ordinary one was found to be as full of holes as its radiograph indicated; the boronized one was perfect.

X-Ray as a Bug-Killer.

Still another field has been opened up at the laboratory for the new style X-ray, and that is as a bug-killer. A vast number of experiments have been made with the early types of Roentgen tube to ascertain the effect of the X-ray on animal life.

However interesting these may have been they are valueless from a practical standpoint because no data is given regarding the size or quality of the dose of X-rays given.

Early in 1916, Wheeler P. Davey, of the laboratory staff, undertook to find out whether the new style X-ray was a cure for Tribolium Confusum, which, in plain United States, is the flour weevil, a bug about the size of a grain of wheat, and which, according to the Department of Agriculture, is the worst enemy of cereal products.

You can believe this when you understand that they live, die, and are buried in the flour-barrel, or in whatever victuals they may stake out a claim. To make the matter still more appetizing, the larvæ shed their skins six times.

Tribolium made drives on flour and meal and such like, doing $100,000 damage as long ago as 1895. Now it is at work in every State, and doing immense harm, all the more serious since the world is menaced with famine.

A gallon or so of bugs were raised at the research laboratory with which a most elaborate series of experiments was in progress at the time these lines were written. The fact has already been established that X-rays will kill T. Confusum, and the laboratory means to stay on the job until it has developed a commercially practicable process of treatment that will make it unnecessary hereafter for the housewife to kill the flour before transforming it into the succulent, matutinal flapjack, so beloved by the agriculturist.

Everybody who uses electric light has practical evidence of the extent and value of the work done by the research laboratory in this field.

In the last fifteen years the incandescent lamp, which enables so many millions to earn their daily bread or read their evening paper, has progressed from the costly and inefficient carbon filament to the metalized carbon, the drawn-wire tungsten lamp, to the gas-filled lamp, which is six times as efficient as the carbon filament. And research is still continued.

WHEN DR WILLIS RODNEY WHITNEY CAME TO THE RESEARCH LABORATORY AS DIRECTOR, HE HAD A HALF-TIME JOB NOW HE'S GOT A TIME-AND-A-HALF JOB, AND OCCASIONALLY HE GETS A CHANCE TO EAT AND SLEEP

Laboratory equipment for lamp-work includes a small but complete factory for making lamps with a capacity of one hundred a day—solely for experimental purposes, of course—including a dozen ovens of various types, welding, filament-winding, and other machines, two different types of apparatus for making pure nitrogen and for purifying argon and a balance for weighing the density of gases.

Then there are four different types of photometers for measuring the light produced by the lamps and an optical pyrometer for measuring the temperature of the filaments while producing light.

There is a bewildering array of electrical apparatus for life-tests of the lamps, a

color-booth for studying color-values of the glass used in lamps, apparatus for studying residual gases in vacuum lamps and for photographing filaments while burning.

In connection with lamp-work 50 pounds of tungsten oxid is produced daily in another part of the laboratory. Not so very long ago disinterested persons took the trouble to assure the G. E. Company that it was impossible to make lamp filaments out of tungsten because the stuff was so brittle you never could do anything with it.

It does seem so, for a fact; for tungsten oxid looks for all the world like so much dust taken from the middle of the road during a long dry spell, although it is very much heavier than dust.

But how it does stick! Visitors who may be tempted to handle tungsten to see how it feels are advised that the best way to get the hands clean afterward is just to peel the hide off along with the tungsten.

Made Tungsten Ductile.

Notwithstanding this friendly tip—which is reminiscent of a book demonstrating conclusively that steam navigation of the ocean must, from the very nature of the case, be forever impossible, which was brought over by the first steamship to arrive from Europe at an American port—the research laboratory kept at the problem until it found out how to make tungsten ductile, then how to draw wire hard enough to cut glass. The result has revolutionized electric lighting.

The swiftness of progress in the manufacture of incandescent lamps in which the research laboratory has played a conspicuous part, is thus summarized by Dr. Whitney:

"I have seen whole factories entirely overhauled a number of times in the past few years in order to make the newest lamps.

"Not only have entire floors of complicated and expensive machines for making carbon lamps been thrown out and new machinery for making metal filament lamps installed, but before packing-cases containing new machines could be opened and unpacked in the factory they have been thrown out as useless, as the advance from squirted-metal filaments to drawn-wire filaments proved the better way.

"Before the limit of factory efficiency on vacuum lamps could be reached the introduction of nitrogen into the lamps brought the factories an entirely new factor; and before the consumers had more than commenced to feel the effects of the nitrogen-tungsten lamps the manufacture of argon, and its introduction into the incandescent lamp had become a reality."

Lab. Has Its Own Private Mechanics.

This lamp-factory affords a clue to the reason why so large a force of highly skilled mechanics is needed in the research laboratory. They are occupied in making the things with which the scientific staff conducts experiments, including pretty much everything on earth or the waters under the earth, not to mention some matters and things that are not dreamed of in our philosophy, *Horatio.*

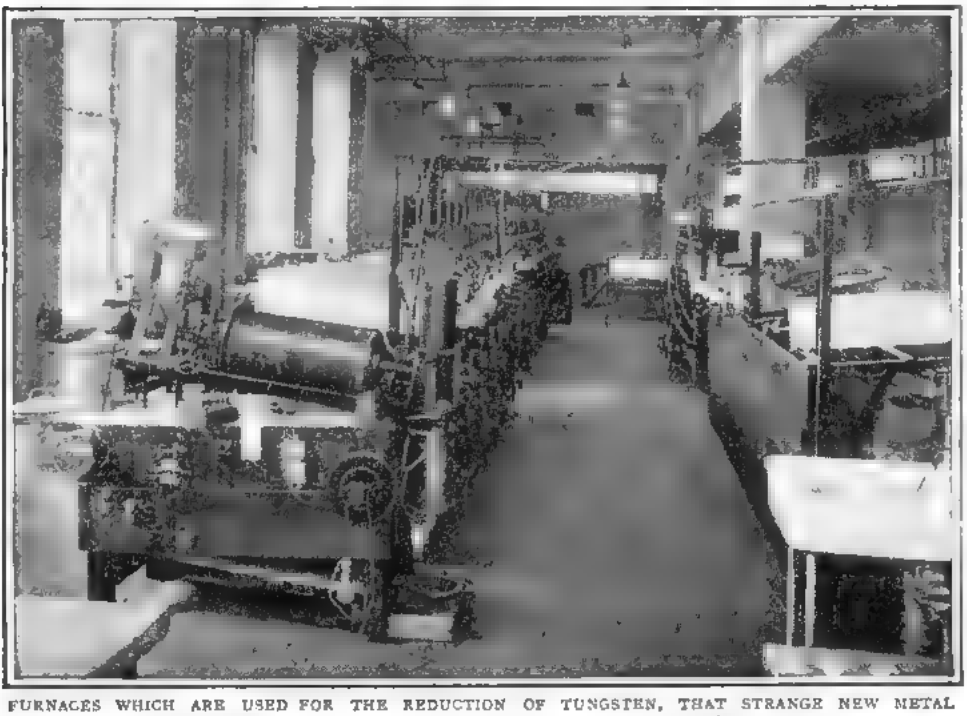
The outfit includes a carpenter-shop, grinders, crushers, pulverizers, and rolls, an exceptionally complete machine-shop equipped with a great variety of lathes, drills, milling-machines, shapers, punches, swaging-machines, a sixty-ton hydraulic press, and abundant bench-room.

Because of the importance of insulation in electrical apparatus the laboratory continuously devotes much time to it. Many new molded compounds have been produced, improving and reducing the cost of countless devices.

Improvements have been made in varnished cloth, enamels, and other standard insulations, while new types have been developed, such as the mineral insulation used in the sheath wire for heating-devices recently brought out. Of course there is an analytical chemical laboratory of generous size equipped with work-tables covered with glazed tiles, hoods, and a draft-proof balance-room.

A room for investigations of transformer steel and other alloys is equipped with a number of electric furnaces of various kinds in which hundreds of special alloys have been made and tested and composite metals have been developed, including a substitute for platinum in dental work.

AMONG THE MOST IMPORTANT TOOLS CONTAINED IN THE RESEARCH LABORATORY OF THIS COMPANY IS A LIBRARY OF 1,400 VOLUMES AND ALL THE SCIENTIFIC AND TECHNICAL JOURNALS OF EUROPE AND AMERICA



FURNACES WHICH ARE USED FOR THE REDUCTION OF TUNGSTEN, THAT STRANGE NEW METAL WHICH HAS WROUGHT SUCH REMARKABLE IMPROVEMENT IN THE DEVELOPMENT OF INCANDESCENT LAMPS

On the same floor are machines for drilling diamonds and polishing jewels, and apparatus for testing motor and generator brushes. The quality of the brush has so great an effect on the operation of direct-current motors and generators that the laboratory has devoted much time to developing new grades of brushes better suited to the various machines than any formerly on the market.

Kicking Scientifically Abolished.

These researches have resulted in abolishing the causes for a number of chronic complaints about motor operation, and in other cases have improved the operation and lowered the maintenance cost.

An important service demanding the constant attention of the laboratory and occasionally demanding all its resources arises from the specific problems of factory production, such as the improvement of processes, the location of hidden troubles, and the development of new or better materials.

There are countless special investigations, each of which may be the work of a few hours, or which may extend over months or even years.

Yet another phase of laboratory activities is exemplified by Dr. Saul Dushman, who for some time has been studying the structure of the atom, which, according to the dictionary, is "An ultimate indivisible particle of matter." It would seem as if "An ultimate indivisible particle of matter" was about as far as you could go; but then the dictionary was compiled years ago, while Dr. Dushman is on the job to-day.

Already he has succeeded in carving the atom into as many portions as a table d'hôte chicken, and he isn't through yet. He says:

And When the Atom Is Cut Up—

"Experimental evidence warrants us in concluding that the atom consists of a positively charged nucleus of extremely small dimensions situated at the center of the atom, and a number of electrons arranged around this nucleus."

And what will Dr. Dushman do with the atom after he gets through dissecting it?

Bless your heart, he doesn't know!

An important part of the work of the laboratory staff can be truthfully described only in the slang phrase, "I don't know where I'm going, but I'm on my way." Or in the more dignified phraseology affected by scientific folk:

"The laboratory is continually conducting researches of a purely scientific nature and publishing the results in an endeavor to contribute its share to the progress of scientific thought, which is rapidly enlarging, modifying and clarifying our conceptions of the fundamental things underlying all physical sciences.

"These investigations may be initiated because of their scientific interest, without any definite, practical object in view, but every marked advance in science has sooner or later, directly or indirectly, resulted in important effects on industry; and these laboratory investigations have certainly nearly always had these practical results.

Pure Science Precedes Practical Results.

"The study of electron emission and the various practical utilizations of the principles discovered by Dr. Langmuir, is a case in point. The gas-filled lamp, now known as the Mazda-C, had its origin in the results of an academic study of the laws governing the loss of heat in small wires coupled with the results of an investigation of the evaporation of tungsten. The metalized filament lamp resulted from experiments with a high-temperature vacuum furnace. In none of these cases was the practical result foreseen when the research that made them possible was started.

"Of course, even in those cases where unforeseen practical results are made possible by the new insight into fundamentals, gained from purely scientific research, they seldom first appear in fully developed form, like Athena sprung from the brain of Zeus, but much work, inventive and experimental, specifically directed to the end in view, is usually necessary before that end is reached."

Dr. Whitney himself expressed the matter better. Said he:

"The impossibility of foreseeing the application of a research and the certainty that all knowledge is of use might be illus-

THE RESEARCH LABORATORY OF THE GENERAL ELECTRIC COMPANY, AT SCHENECTADY, NEW YORK, IS KNOWN AS BUILDING NO. 5, AND NO VISITOR TO THE BIG PLANT WANTS TO MISS A TRIP TO IT

ONE OF THE ROOMS IN WHICH EXPERIMENTS ARE CARRIED ON FOR THE PURPOSE OF CONSTANTLY MAKING IMPROVEMENTS IN THE LAMPS WHICH THE COMPANY MANUFACTURES.

trated by a thousand cases. No one fact, well known, can exist without reacting on the remainder of knowledge.

"In 1895 and 1898 the first discoveries of X-rays and radium rays were made. The facts as they were disclosed fed every science.

"Chemistry was given a jolt it had thought could never occur.

"Physics went back to the consideration of dimensions thousands of times smaller than before.

"Electricity's views of conduction were enlightened and the phenomena of electrical insulation of gases and oils were clarified.

"Medical diagnosis and surgery were given additional eyes and therapeutics a new reagent.

"From the man who to-day sees gas-holes in iron castings to the one who studies heredity by exposing eggs and sperms separately to the rays, all have to thank those who carried out the necessary researches on these rays. Few or none of these applications could have been predicted prior to 1895. What could have been predicted, however, with certainty, was that some uses could be made of such disclosed facts."

Lest the tremendous importance of scientific research in modern industry should not be properly appreciated, the fact should be mentioned that the General Electric Company also maintains laboratories at its plants at Lynn and Pittsfield which specialize on the production problems of those works.

There are lamp development laboratories at Harrison and at Cleveland which develop and standardize new processes, materials, and designs for the lamp-factories. There is a physical laboratory at Cleveland which conducts researches of a highly scientific order in the physical and physiological aspects of light and illumination.

At Schenectady, in addition to the research laboratory, is the illuminating laboratory devoted to illuminating engineering, the selection of the best lighting unit, and the best method of utilizing it for a given lighting system.

Also there is the consulting-engineering department laboratory, devoted to general and special engineering problems and particularly to the investigation of high-tension phenomena.

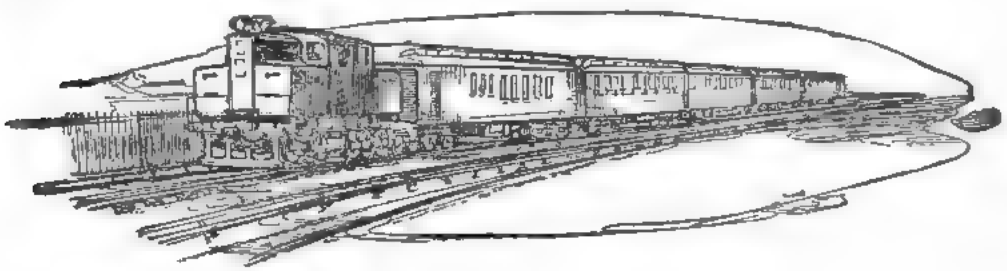
There is the testing laboratory investigating and testing the physical and chemical properties of materials.

There is the standardizing-laboratory in charge of the standardization of all instruments, developing new instruments, like the oscillograph, and investigating and developing these methods.

In addition to all this the various engineering departments conduct many special tests which they are specially equipped for handling which sometimes amount to research work of a high order. The research laboratory was organized and equipped for general research.

Other manufacturers have been quick to see the value of scientific research. The Du Pont Powder Company employs 250 chemists who pursue their investigations in 76 little buildings scattered over 60 acres, and yield their employer a profit of a million dollars a year.

A tire manufacturer spends $100,000 a year on his laboratory. The electro-chemical industries at Niagara Falls, the metallurgical industries and many others now follow the fashion and invest largely in organized research from which they reap large profits.



STEAM SPEAKS!

BY J. PAUL GRUET.

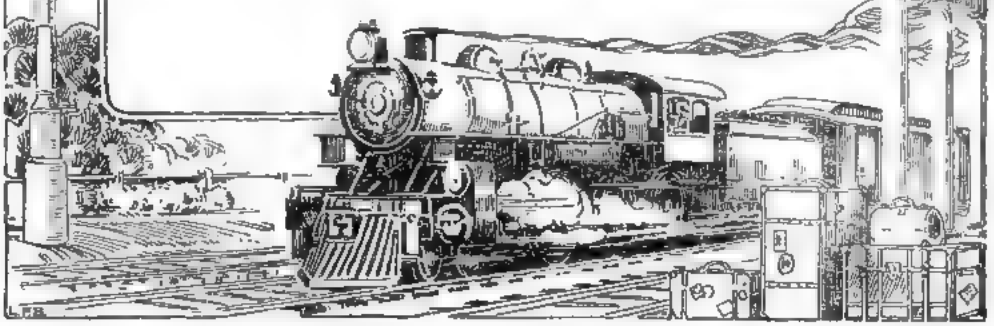
SAY, man!
I whistle in your new-born day,
And bid your world arise;
And I blow myself with the fading dusk
That you may rub your eyes.

All day I do your hardest work,
The job none else can do—
I run your trains and ply your ships
Which come and go for you.

I bore your rock with a bit of bar,
And shoulder your steel with a will—
Though you shut me off on the downward slope
Who has to pull on the hill?

I've built your airiest, fairiest castles,
Your bridges connecting land,
And even your towering lighthouse as well,
Where you yourself can't stand.

I've conquered your heaviest elements,
The strength of your all mankind;
And I've kept your world in progress so,
Which your time would leave behind.



BOOMER JONES DISCOURSES ON LOVE.

BY J. W. EARP.

Beware of These Soft-Soap Sirens, or You'll Become an Automatic Meal-Ticket.

MAUDE MARTIN and Francis Fishman, motion-picture stars, who had honored our railroad for a few days, were going through a love scene, without much success, if you could judge from the language of the director.

"Great Halifax!" he bawled, and waved his arms frantically. "Can't you two put a little pep in that scene? Now, this is no formal reception with a hand-shaking committee. Not on your life! This, my two muckle-headed, overpaid friends, is supposed to be a love scene. Now, do you get me?"

"Somehow or other I can't blame Frankie much," said Boomer Jones to Peggy Lane.

Peggy was a player of minor parts, in addition to being a writer of scenarios. Peggy was very pretty and she had captivated the Boomer completely. One glance at Maude Martin and the Boomer lost all interest in the star.

"Why, Mr. Jones?" asked Peggy.

"Because she is as short on looks as I am on funds. On the level, if I had to make love to her I'd take the tramp route. She looks like a dame I almost married in St. Paul. This dame was so homely that whenever I looked at her I got dizzy. But she sure had lots of money."

"Yet you didn't marry her?"

"Nope. Her looks outweighed her bank-account, so far as I was concerned. On the night of the wedding I got cold feet and sold out my interest to a bankrupt duke the matrimonial agency had on file. They told me afterward that he went to the altar blindfolded."

"Heavens, Frank!" exclaimed the director, as he waved his arms frantically and literally tore his hair. "Maude's not made of Dresden china! Take a hold, will you, take a hold!"

"Shut your eyes and go to a clinch, Frankie, old sport," said the Boomer.

Everybody present laughed. The director turned on the Boomer and said in scathing tones:

"Any time I want or need your advice, Mr. Brakeman, I'll ask you for it. You've got all you can do to attend to your own business instead of trying to attend to mine. I know my business; it is directing motion-pictures."

And with this parting shot the director turned his back on the Boomer and once more engaged the attention of the players.

"Know your biz, do you?" sneered Jones, addressing the director's back. "Now listen to me, old Single-Hair-in-the-Head, and I'll explain a few things to you.

"In the first place, we don't lasso runaway cars with a rope when one gets away from us. Next, we don't take a little dinky six-wheeled switch engine and outrun limited passenger-trains with them, especially when these limited trains are hauled by one of the new high-wheelers.

"The third is that we don't very often have head-on collisions on double-track roads. It might happen on motion-picture roads, but not in real life.

"Outside of these and a few hundred other mistakes I've picked out in the pictures you've directed, your directing is O. K. But you've got lots to learn about the railroad game. You're going to stage a dramatic railroad scene some time that is

going to be the cause of thousands of railroad men dying from laughter when they see it."

The Boomer turned back to Peggy.

"Guess that 'll hold him for a while."

"Ought to," said Peggy. "That was sure hot stuff."

"I can reel that stuff by the hour," said Jones with becoming modesty. "It isn't often I get sarcastic; but when I do I burn the ground under and around them."

It is doubtful if the director heard a word Jones spoke. If he did he gave no heed of it, and showed no signs of having heard when he turned around to Jones and said:

"Mr. Brakeman, you may give the engineer the proceed-signal for about three—yes, four, rods."

"What's that?" inquired Jones, a queer look spreading over his face.

But the conductor saved the day.

"Slip the hoghead the easy sign to slack ahead for a three-car spot. The cars cast a shadow, and he wants the sunlight."

"Why don't he speak English, then?" growled Jones, as he began waving his arms toward the engine. "These guys throw the funny stuff and expect me to translate it. He called this guy an engineer—bah!" The Boomer spat disgustedly. "That hammer-headed throttle-tickler hasn't the least idea as to what an engineer looks like."

It was the engineer's minute off, and he was napping. The Boomer waved his arms a full minute without attracting any one's attention on the engine. With an exclamation that showed his disgust, he growled:

"Hang it all, he must think he's on a passenger-train. He's worse than Tod Ensign used to be. Tod never pretended to look back for a signal when he was on a freight, and this peculiarity of Tod's almost drove the conductors crazy.

"Sure, they had brakemen on the head-end. But those guys were always short on the shut-eye problem, so you couldn't depend on them to cast an optic crummyward. After a man has just finished an eighteen-hour session of stud poker when he should have been asleep, you can't expect him to do any extra looking when he gets out on the road. And the men in those days were always about three days behind in their sleep.

"One night Tod is pulling Sniffles Walker behind forty cars of sheep. Somehow the angle-cock, just ahead of the caboose, gets turned, and of course shuts off the juice from the hack.

"Then some one must have pulled the pin on the hearse, because they went off and left her stranded out on the wild and woolly prairie. Tod goes thirty miles before he discovers that the brain-wagon isn't holding down the rear end. And Ray Bogue told me that the language Sniffles used barred him forever from polite society.

"Of course, they had an investigation. Tod draws thirty brownies, and these brownies break him of the passenger habit. He got so he wanted to look back all the time.

"One day they have a new fireman. They've been sailing along pretty steady, and as all the curves are on the fireman's side, Tod begins to get a little bit nervous after they have covered something in the neighborhood of twenty-five or thirty miles. Finally he looks over at the diamond-cracker and says:

"'Pat.'

"'Yes, sir.' says Pat.

"'Look back and see if the king and his chariot are coming.'

"Pat skins an eye back over the train, and then announces that they still have the necessary. This satisfies Tod, and he goes back to his day-dreams.

"But when they stop for water at Elson it was just as if they had hit a brick wall that wouldn't budge. It stirs things up considerable in the crummy, and the boss is sure peeved when he arrives at the head end. He says:

"'Say, if there isn't anything on that engine but the straight air and a Johnson bar, I want to know it, so I can make a report to the M. M. You knocked our dinner off the stove back in the hack, and I almost swallowed my false teeth when you stopped.

"'The caboose is off center, and the drawbar in her is rimmed. And furthermore, I want you to understand that Rule 19 says that trains of over twenty cars must

cut their engines off when taking water. Get me?'

"'I'm sorry,' says Tod, 'but my intentions were good.'

"'Intentions!' snorts the brains. 'The hospitals are full of the results of good intentions.'

"Then the captain goes over to the office to see what the operator has on the board, and also to relieve his feelings some more.

"When we get started again Tod is still sore about the con bawling him out. He doesn't say anything for a long while until finally he gets worried about the crummy. He stands it as long as he can, and then he says:

"'Pat'

"'Yes, sir,' answers Pat.

"'Look back and see if that blamed lion and his cage are still on.'"

While the Boomer was telling this tale he never once stopped swinging his arms. Then he paused long enough to borrow a cigarette from Henderson and air his opinions once more.

"Isn't it awful? That guy thinks because he has manual-block protection he can sleep."

"What is a block?" asked Ted Gibson, who up to this time had been rather more silent than was his wont.

"What I am referring to is the engineer's thinking apparatus," said Jones. "But over in the town where I live it's twenty kids, forty marbles, two pair of roller-skates, a baseball game, and a free-for-all fight from daylight till dark. Wow! Will you wake up, you short-time graduate from the employ of the coal trust?"

And the Boomer raved as he waved his arms.

One of the Boomer's thought-waves must have struck the engineer, for he popped his head out the cab window and looked back. He saw the signal and at once began to slack ahead. As soon as the cars were spotted the head disappeared again. The Boomer mopped his brow and voiced his indignation.

"Two to one he's in the hay again. One spot and he hops to the idea he's earned his daily wages. And some one called him an engineer! Bah!"

"Shades of *Romeo!*" the director was bawling. "But you two are loving—yes, as loving as a couple of sick cats. We will rest a few minutes and then we'll get busy again on this scene. And this time it's going through or I'm going to know the reason why."

"Love is a queer thing, isn't it, Mr. Jones?" asked Peggy.

"Queer nothing!" snorted the Boomer. "It's a disease like the mumps; if it's on both sides, though, you're sure bound to have a swell time. There's only one cure for it, and to my notion the cure is worse than the disease.

"It's funny about some people, isn't it? Take me, for instance. I've been on the ragged edge of the sea of matrimony a dozen times or more, yet I never got my feet damp; but my poor old friend, Otis Brewer, couldn't even let the wind get in his direction without going under.

"He had seen the marriage certificate so many times that he knew the right place to sign his name. Whenever he'd hear the strains of the wedding march he'd prick up his ears, throw back his head, and start down the aisle to the preacher's desk.

"He was known by every license clerk in the State of Kansas. When they would see him coming all they would do was to pull the record-book out and say, 'What's her name?'

"If practise made for perfection, Otis was one thousand per cent pure. But it got him into trouble at last.

"As I said before, Otis had been tied up to so many dames he couldn't remember all of them. I've often wondered how he kept track of when he was married and when he was not. But he did up to the time we hit Arlington.

"It started when we were working for the Missouri Pacific out of Helper. One pay-night Otis breaks the bank at Pete Bernard's gambling-house, by way of the roulette route. He has about ten thousand bones in his kick when we march down the steps together.

"'Harry,' he says to me, 'you and I are going to Frisco and see the Golden Gate.'

"We did. We went to Frisco on Pullman cushions with dusky-hued gents ready

to turn flip-flops if we crooked our elbow. We came back over the same route in box cars, flat cars, gondolas, and, once in a while, crummies. I've washed dishes for every Chinese joint between San Francisco and Denver; and I know the name of every policeman and marshal in the different towns along the line.

"When we finally got a job it was at a town in Oklahoma. El Reno's the name—some town. Our run is to Arlington, which is situated on the banks of the river Verdigris.

"About twice a year this Verdigris gets up and overflows its banks. When it does the cook at the little restaurant where railroaders ate used to perform on stilts in the kitchen and the waitresses sported rubber boots that came to their hips.

"They'd take your order, yell it to the cook in the kitchen, and he'd get busy. When the order was ready he would open the window to let the current in so as to float your order out to you. Some system, believe me!

"The first night we are in the town was the night when the river does its usual stunt of overflowing.

"We waded up to the counter by plowing through three foot of water.

"The stools are high and dry, for which I am truly thankful. The girl that waits on us gives us the once-over with a fishy eye and says: 'What 'll you have?'

"'Ham and,' said I, 'with the *and* straight up.'

"'Caboose and a pair of markers,' says this dame to the cook in the kitchen.

"That's a new one on me, and I file it away for future use. She looks at my conductor and says:

"'Whatchuwant?'

"Bacon and scrambled eggs with hot cakes, is his order, and she yells again:

"'Side-wheeler with twin headlights, bust 'em and give 'em running-orders.'

"'Some stuff,' I remarks to the brains, and he nods.

"'Your order, deary?' she says to Otis in a sweet mushy-mush voice, and I get suspicious.

"'Cakes and eggs,' says Otis. 'One egg up and the other over.'

"'Adam and Eve want running-orders; hit Adam in the eye!' yells this startling dame, and I pass.

"'Where you from, kid?' says Otis.

"She says that she's from Chi. And this hits Otis just right, because that's his own home domicil. While they are getting the orders ready these two get talking.

"'I'll bet it's lonesome here,' says Otis.

"'Lonesome!' says this dame. 'Well, so I should remark for your special benefit, it is. The curfew tolls the knell of parting day at exactly 9 P.M. in this shine of a burg. If you chance to be on the street after that they throw you in the little red van and take you down to view the rising of the morrow's sun through the barred and grated windows.

"'If your hat was to blow off your head on Main Street at 3 P.M., there wouldn't be anybody to chase it for you or to see you chase it. History is barred from the schools. If the children want to know history they go down to Bower's store after supper-time and get it hot off the bat from the bunch of old-timers that hang around the place.

"'Old Charlie Anson is the biggest spieler of the bunch, and to hear him tell it I think he fought in every battle of any consequence that came up in the Civil War. There's only one thing that puzzles me, and that is why he don't draw a pension on account of him having a bullet-hole in the middle of his back.

"'If you dance, you're on the road to the hottest summer resort known; short skirts are an invention of the devil; silk hose are perfectly scandalous; and a motion-picture show's announcement of a coming engagement calls out the vigilance committee for the protection of the young and innocent.

"'They think that Eddie Foy is some new kind of breakfast food; George M. Cohan's a Jewish pawn-broker; Billy Murray's a grand opry singer; and the two latest books out are "Fighting the White-Slave Traffic" and "Why Girls Leave Home." I didn't think it possible, did you?'

"'You don't say!' says Otis.

"'But I do, my dear,' says this dame.

'But it won't be long before I have my little stake made; and then back to the bright lights for yours truly.'

"And she nods her head at Otis. I see by the look in Otis's eye that he is about ready to pop the question of self-support to her, so I head him off by asking this dame if the orders aren't about ready.

"She says for me not to worry; that the orders will be in as soon as they are done. And sure enough she doesn't any more than get the words out of her mouth than here the orders come.

"My caboose and markers lead the parade and are displaying the green for the C. R. C.'s side-wheeler, headlights, and running-orders, while one-eyed Adam, with his partner Eve, is bringing up the rear.

"My caboose sideswipes a counter-leg and the O. R. C.'s side-wheeler hits us in the rear. Then one-eyed Adam comes up and makes the prettiest triple wreck you ever saw.

"The side-wheeler went to a watery grave, and Adam got lost in the shuffle. Eve attaches herself to the only marker I have left and sails safely in.

"The waitress sees the wreck and does the deep-sea dive and brings up Adam's eye. She gives her boots a hitch and says:

"'Eat 'em up quick, and I'll chase you another order at once. Wrecks are not stood for by the management—motto on the wall says "All goods shipped consignee's loss and shipper's risk"; in other words, every man his own shipper. See? But on account of my little friend here, I'm going to see you don't go hungry.'

"Then Otis gets to throwing the mush and goo-goo stuff, until I yell for him to shut up. But he was a lost human from that minute on. That dame had a line of talk I haven't ever heard equaled yet, and she just wrapped Otis around her little finger.

"Whenever he was in town you'd find him hanging around the lunch-counter or else over on the porch at the house where she roomed. I've seen hard love-cases, but this laid over anything I had ever met up with before.

"I finally gave up trying and hoped against hope he'd come around before the preacher did. Then came the first big pay-day, and that was the day the stunt was pulled off.

"The wedding was set for five-thirty. Otis lays off, and I do, too, so I can go with him and see that he gets a square deal. The conductor gets a caboose-hop and arrives in time for the wedding, so we were all there.

"Just as soon as the preacher ties the knot this dame marches Otis over to where a big guy is seated and introduces him.

"This guy has a neck on him like Frank Gotch; and his chest looks like it might belong to Jeffries. On his hip he has two big guns that for caliber and size look just like the ones our old friend Deadwood Dick used to carry.

"'Otis dear,' says this dame, 'I want you to meet my brother Bill, the best all-around marksman and pugilist in Oklahoma. It will please you, dear'—you ought to hear her slur the 'dear' part of it—'to know Brother Bill is going to make his home with us.

"'And I want you to understand right now, you little sawed-off shrimp, if you ever try to give me the slip again, like you did in Omaha that time, good night to you!

"'Indorse that check in your pocket and give it to me. Then you beat it to the dog-house and bring up what clothes you have down there and put them in my room at the hotel. Then you and I will hunt a home.

"'And you just try running away, you little knock-kneed, pigeon-toed imitation of a human being, and I'll have Brother Bill chase you to Kingdom Come. This is the second time I've stood before the preacher and swore to "love, honor, and obey," and it's going to be the last.

"'No, Otis dear, this is the last time you march to the wedding strains until I turn up my toes and ask St. Peter for a pass to the streets of gold.'

"And while she talks Otis just opens his mouth like a fish and gasps:

"'Maggie!'

"'Yes, Maggie!' says this dame. 'You recognize me now, do you? I'm the one woman you've married twice'

"And Otis just groans and sinks in a little heap on the church-steps."

Jones paused. Peggy looked first at Ted, then Henderson, and finally let her gaze wander back to Jones.

"What did he do, then, Mr. Jones? Did he live with her after that?" she queried with a smile.

"Yep. The last time I heard of Otis, he was still doing his laps up and down the Frisco pike. His wife had quit the restaurant job and was raising Otis a family. Brother Bill was still on the job as watch-dog and was making good.

"Which only goes to prove, what I said about love being a disease. Some guys aren't satisfied unless they're traveling double harness.

"But take it from me: beware of these sirens who can pass out the soft-soap gab! When they start you want to pick out the shortest road out of town and run for your life because it's a cinch this dame is getting ready to pass Freedom a solar blow for a knockout, and your chances are pretty good that you'll be an automatic meal-ticket for the rest of your life."

"You're a cynic, Mr. Jones," said Peggy.

"Whatever that is," grinned Jones.

I. I. OK. AY.

BY ELMER EDMOND JOHNSON.

AT a hamlet called X, a young fathead named Rex,
Sat down at the key the despatcher to vex.
Said D. S.: "Can you copy a '19' for five?"
And the ham, unaware he was even alive,
Sent this sleepy reply without batting an eye:
"I. I. OK. AY."

THE despatcher once more, though it goaded him sore,
Spelled the question out slowly, and silently swore;
And he wanted to know of the fathead named Rex,
If any east cars were left over at X.
But the ham, with a sigh, made this cryptic reply:
"I. I. OK. AY."

THEN D. S. tore his hair in the depths of despair,
And he pounded his key through the table, I swear!
And he said to the ham: "You poor, ignorant mole,
Go hang yourself up to a telegraph pole!"
And the ham, nothing shy, made this cheerful reply:
"I. I. OK. AY."

NEXT morn the despatcher, a fellow named Thatcher,
Was carted away by a lunatic snatcher.
And all the day long, in his iron-barred cage,
He pounds on the floor in a frenzy of rage.
If you question him why, he will snarl and reply:
"I. I. OK. AY."

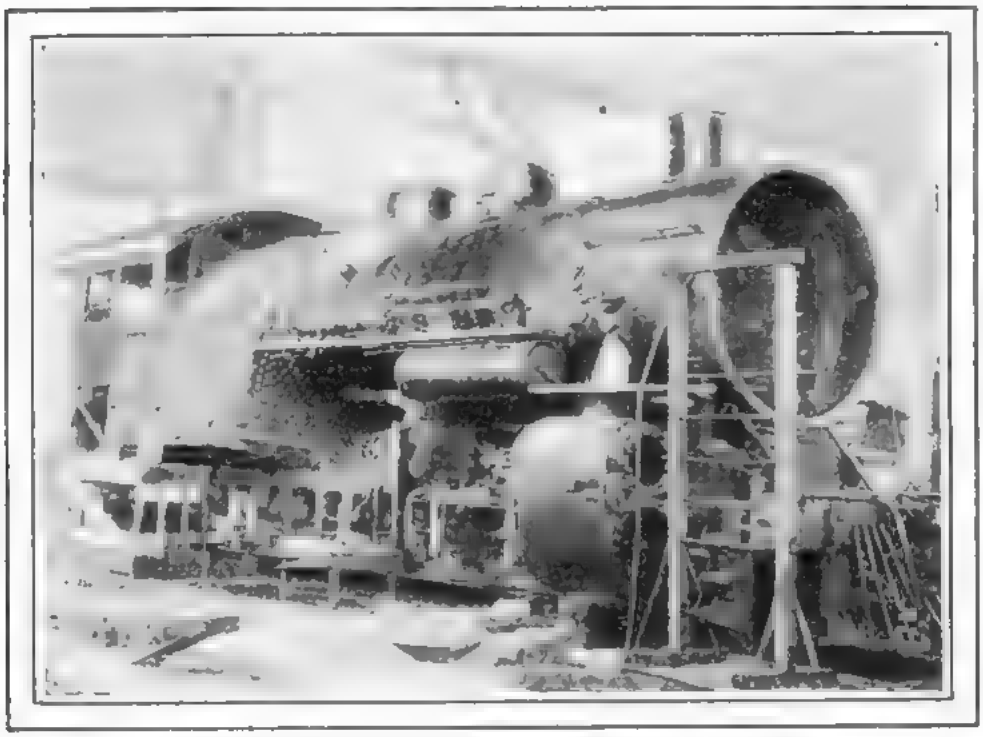


FIG. 1.—THE APPEARANCE OF THE LOCOMOTIVE AT 9 A.M. MONDAY

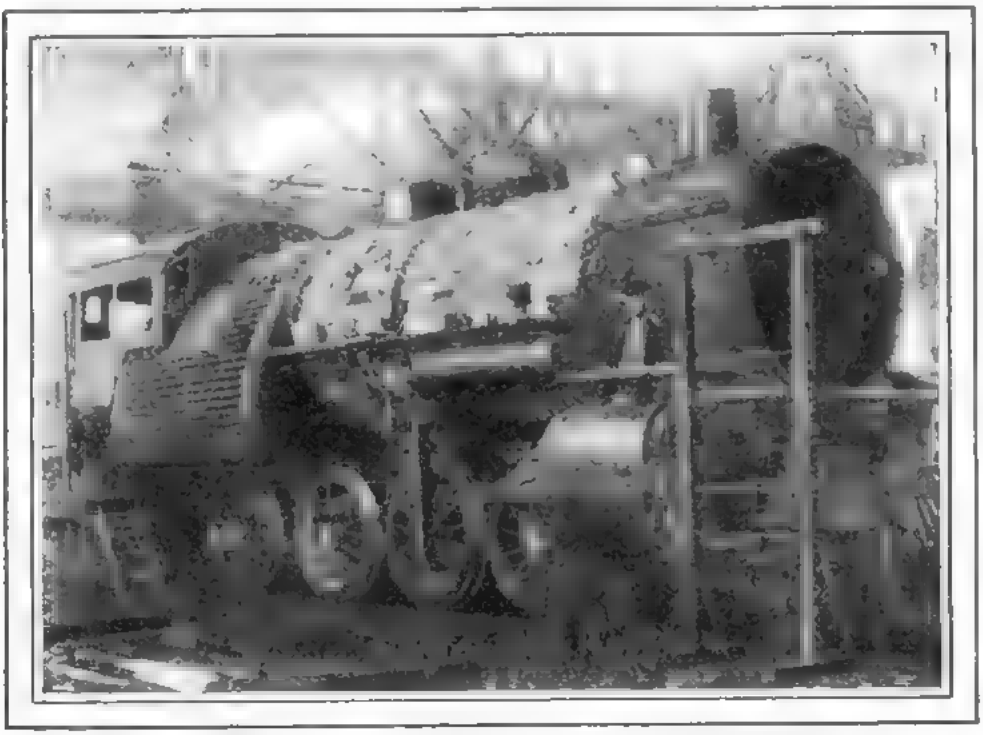


FIG. 2.—THE BIG CONSOLIDATION AS IT LOOKED AT 1 P.M. MONDAY

SPEEDING UP LOCOMOTIVE REPAIRS.

How a Big Consolidation Was Overhauled Complete in 33 Hours at the Delaware and Hudson's Colonie Shops.

BY J. W. GREENBERG.

IN these days of automatic stokers, interlocking machines, quadruplexes, and the million and two other devices designed to allow railroad men to enjoy life and do away with all—well practically all—work, it doesn't surprise us much to read of a new speed record of some kind in the operating department every time we pick up our morning paper.

Now Miss Efficiency has entered the locomotive shops and turned a new trick there in the way of speed. This particular performance took place recently at the Colonie (New York) shops of the Delaware and Hudson Railroad.

They overhauled a locomotive of the Consolidation type in the neat little space of thirty-three hours. Yes, sir, they put that old girl through the traces, dressed her up and down from head to foot, and had her pounding along the iron, spick and span, with a good-as-new smile on, in less than a day and a half.

Inspected Boilers, Too.

And just by way of good measure, they gave her boilers the external inspection which Uncle Sam insists upon every five years, an operation which requires the removal of the entire lagging.

Not that such hurry-up work is an everyday stunt at the Colonie shops. It isn't. But this locomotive was one of a class in great demand and this was a special case where the men aimed to get the engine in running condition with the least possible delay.

Here is what was accomplished between seven o'clock on a certain Monday morning, when the locomotive was brought into the shops cold and badly in need of overhauling, and at four o'clock of the next afternoon, when it was shipped out.

They started in by removing things. Off came the full jacket and lagging; then somewhere between twelve and thirteen hundred Tate caps, and the superheater flues.

Next the small tubes were rolled and prossered. Tires were turned. New shoes and wedges and new driving-brasses were added. The lower guides were planed and ground, and the crosshead rebabbited.

Went Over Air-Brake Equipment.

The throttle was ground, also, and the main and side-rods and drawbar annealed. Then, just to make a real complete job of it, they overhauled the entire air-brake equipment and gave the engine new rod brasses.

Figure 1 will give an idea of what the big locomotive looked like at 9 A.M. Monday, as she stood on the wash-track, just two hours after being brought into the shop. Even in that short time the men had accomplished considerable work.

Boiler-front and netting had been removed, the locomotive was completely stripped, the lagging and jacket removed, the wheels dropped, the superheater units removed, and the boiler was ready for the first test. In addition, the valves and the bottom guide-bar were taken out and new shoes and wedges were applied ready to be laid out.

As soon as the superheater units were removed, the men started taking off the big superheater flues. Although it was unusual

on the road which this engine traveled, the boiler here was found to be so heavily scaled that it took until 6.35 that night to whip it into shape.

At 1 P.M. of the same day, another photograph was taken (Fig. 2) to show the progress that had been made up to that hour. Here, it will be seen, the boiler has part of the lagging applied, and the spring-rigging has been reapplied, too.

The heads of the Tate staybolts have been removed and replaced, and all the staybolts examined.

Now the flues were ready to be removed, and after this little job was completed the new ones were applied in the remarkable time of one hour and twenty-five minutes.

And while the world slept that night, the shopmen at Colonie were busily grinding the superheater ball-joints and replacing

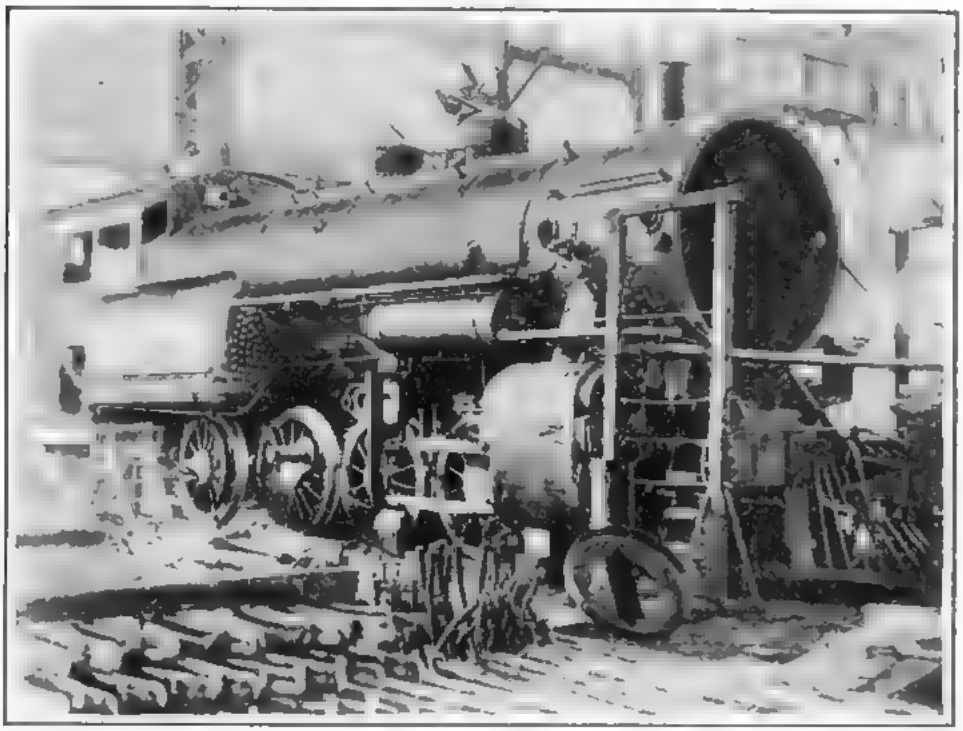


FIG 3.—PHOTOGRAPH OF THE ENGINE AT 5 P.M. ON MONDAY. LOWER GUIDES ARE BACK IN THEIR PLACES, LAGGING HAS BEEN APPLIED, AND JACKET IS ON

By this time the boiler had undergone its required test and the wheels were applied. The latter job had been accomplished during the noon hour when the minimum amount of disturbance would be caused the rest of the workmen, and when the crane was most readily available. Usually, this work is done by the night shift.

What progress was made in the next four hours may be seen in Figure 3, which was taken at five o'clock Monday evening. The lower guides are back in their places, having been planed and ground, the lagging has been applied, and the jacket is in place.

the units, putting into position the front-end netting, hanging the side-rods, and reapplying a large amount of the piping. At seven o'clock on Tuesday morning the greater part of the work had been accomplished.

But there was still a number of little jobs to be done before the big Consolidation could be declared ready for use. For this finishing-off work, the engine was turned over once more to the day force.

During this last stretch, the main-rods were applied, and the motion-work, crank-pins, extension piston-rods, crossheads and

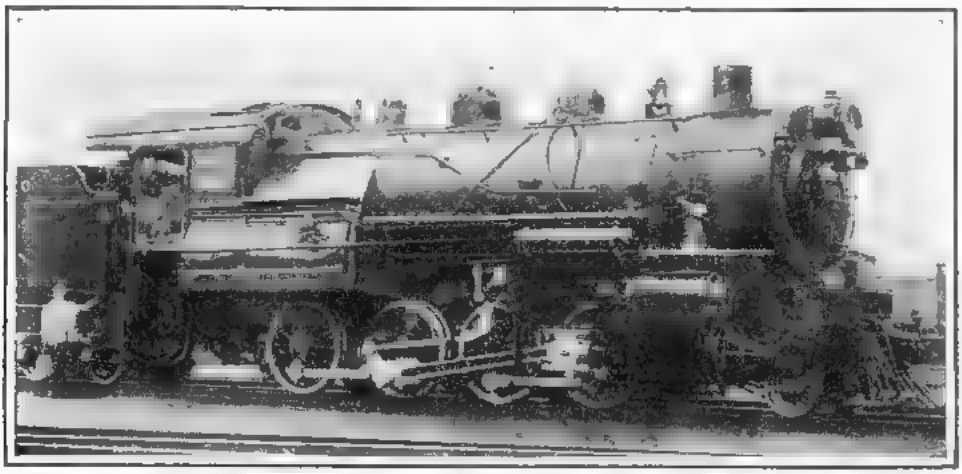


FIG. 4.—COMPLETED LOCOMOTIVE AT 4 P.M TUESDAY READY FOR THE TRANSPORTATION DEPARTMENT

guides, cab-fittings, brake-connections, pops, and the hundred and one other things an engine needs were set in place. Then a smaller engine was pressed into service to move the locomotive in order to square the valves.

Next the boiler came in for a much-needed bath. It took just thirty minutes to fill it with hot water and fire it up. And at four o'clock of the same day, the engine was in the hands of the transportation department—just thirty-three hours after it had been received at the shops.

Figure 4 shows clearly that not a minute of that time had been wasted. It was taken as soon as the repairs on locomotive were completed.

On this job only the regular forces were used. The day crew received a little overtime pay, but in the case of the night shift, which is maintained regularly in these shops, scarcely any overtime was required

Before a locomotive comes to the Colonie shops for repairs, an advance report is received telling approximately what work is to be done. Preparations are then made for its reception and the necessary materials are procured and made ready.

Some of the parts, in fact, such as wedges, shoes, and spring rigging are made up from the new material so that they can be applied without any delay.

At Colonie a shop-schedule system is in use, but in this particular case, because of the necessity for speed in getting the engine ready, the regular rules were not adhered to as strictly as is the usual custom in the Delaware and Hudson shops.

THE RAILROAD PLAN.

BY LEE SHIPPEY.

MY father was a railroad man,
And reared me on the railroad plan:
Whenever I got off the track
Of rectitude he switched me back.

THE CORN-FED MULES AND THE BOOK OF RULES.

BY ALTEN W. CURLEY.

YOUNG Red Smith was an honest lad
Who lived on the farm with his mother and dad.
He got an idea into his head
That he could earn his daily bread
An easier way than from early morn
Till after sundown plowin' corn.
The Frisco trains passed every day
Where Red plowed near the right-of-way.
He saw the smoke cloud the sunny skies;
He saw the hoghead looking wise;
He saw the tallow with bended back
Keeping her hot on a tank of slack.
The hack would pass with the con inside
Looking as if he did nothing but ride.
But the choicest job of all of them yet
Was the shack's, on top with a cigarette.
When Red would turn to his corn once more
The sun felt hot and his feet felt sore.
So he made up his mind that the job he would get
Was the brakie's, on top, with the cigarette.
He saw by an ad in the Hicksburg *Mail*
He could learn from a book to be a rail.
So he bought a copy of Standard Rules
And taught the signals to his mules.
His bridles and lines he threw away,
And signaled by bell as he plowed all day.
Two rings would start the brutes like a curse;
Three rings when standing and they would reverse.
Four rings when running and they'd reduce speed,
And two was the only stop signal they'd heed.
At last the boy had the system down fine,
So he beat it out for a job on the line.
The old man said to his wife next day:
"I believe that kid has run away.
I hope that he will come to no harm,
But he never had sense enough to farm.
I think that in time he might run railroad trains,
For you know he was always short on brains.

I'll finish plowing the corn to-day,
And begin to-morrow making hay."
When the old man started to hitch Red's mules
He'd never read the book of rules.
Where Red hid the lines he never could tell,
So he had to put up with the rope and bell.
Well, he hitched 'em up and got on the seat,
Took hold of the rope and braced his feet.
He pulled the rope and they started to go,
Then he thought their gait was a little too slow.
To the number of yanks he gave no heed,
And the mules took the signals to increase speed.
So when without knowing he had given five rings,
The mules began to scatter things.
They circled around through the corn and hay,
Stopping at nothing in their way.
As they neared the house he called to his wife:
"Go flag a train and save my life!
Just ask the con for his book of rules
To find out how to stop these mules."
She flagged a train; it stopped up short;
The con she found was a good old sport.
"Madam," said he, "if that team of mules
Is pulling the plow under Standard Rules,
Just tell your husband that what he's to do
To signal a stop is to ring but two."
She told the old man that two were enough;
He yelled at her: "Take no such stuff!
What! Two rings to start and the same to stop?
The con must sure have taken a drop!"
So the mules continued upon a dead run,
While the neighbors came in to see the fun.
For sixteen hours they did their best,
And then tied up for eight hours' rest.
When at last the law had got them stopped,
The old man said as his brow he mopped,
"There'll be no more of my good mules
To be examined on Standard Rules."
Red got the job so highly prized,
And the dream of his life was realized
He first joined hands with the B. of R. T.,
And a few years later the O. R. C.
And as Father Time turned over the leaves,
He got gold stripes on his uniform sleeves.
And he smiles as he pulls the bell-cord now,
When he thinks of the time that he signaled at plow.

BIG RAILROADING—3.

(Second Series.)

SILVER SIMOLEONS FOR BALLAST—CENTRAL PEELS $600,000,000 OFF ITS ROLL TO PUT HOUSE IN ORDER.

AT IT SIXTEEN YEARS AND STILL GOING STRONG—OMNIVOROUS MUSKEGS AND PRECIPITOUS CAÑONS ONLY A FEW OF THE OBSTACLES OVERCOME—LITTLE TRICKS LIKE RUNNING FOUR TRACKS UNDER A TUNNEL AND BUILDING LINES ACROSS SWAMPS ALL IN THE DAY'S WORK—MILLIONS MORE FOR ELIMINATING GRADE CROSSINGS, "CANNING" SMOKE, BUILDING NEW STATIONS, AND IMPROVING THE SCENERY GENERALLY.

BY CHARLES FREDERICK CARTER,

Author of "When Railroads Were New."

BEFORE the ennobling influences of the World's Fair had discouraged the use of the knife as a weapon for eating pie, the Palmer House, in Chicago, acquired merit by substituting silver dollars for tiles in the barber-shop floor.

Years afterward, when the New York Central Railroad used silver dollars for ballast, it never got a hand; instead, Congress and the legislatures began framing up schemes for making the corporation cough up twenty-dollar gold-pieces instead of cart-wheels

Orgy of Improvements.

Oh, well! If you make a point of it, the New York Central may not have literally used silver dollars instead of broken stone under its ties; but to a person who never had more than two dollars at one time, it certainly seems as if it might have done so, considering the credulity-staggering sums it has spent for improvements in recent years.

Most railroads are prone to indulge in rebuilding sprees every time they can scrape a few millions together. Corporations will have their fling, you know.

But the New York Central has abandoned itself to an orgy of reconstruction and improvement which has lasted seventeen years to date, has extended from the Atlantic Ocean to Lake Michigan, and has cost—

If the smelling-salts are handy, let me tell you how much money the New York Central has spent for improvements in the sixteen years ending with 1915.

Well, sir, the New York Central spent six hun-dred mill-ion dollars for improvements in the sixteen years ending with 1915; that's what it did!

This sum is more than twenty-six times

the total capitalization ($23,000,000) of the old, original New York Central when it was first organized away back in 1853, which, in days when Sunday clothes were expected to adorn two generations at the very least, was considered so enormous that everybody held up their hands in holy horror and began yelling at Wall Street; and they haven't stopped yet.

Roadbed Got Twice Stockholders' Share.

The aggregate amount of appropriations for improvements for the sixteen years under consideration was considerably more than double the total amount of capital stock to-day.

It was almost three times the gross earnings of the whole system in 1916.

It was more than double the total annual expenditures of the United States Post-Office Department.

It was $134,000,000 more than the world's gold production in 1912, which was the greatest for any single year up to that time.

Having spent so vast a sum in so brief a period, the railroad was not able to let up on the improvement scheme for a single year. In 1916 expenditures for improvements, including those for leased and controlled lines, totaled $32,165,644, which was more than two and a half times the sum paid in dividends the same year.

Be sure, now, not to confuse improvements with mere maintenance charges; for they are another story. The New York Central in 1916 spent for maintenance of way and structures $18,965,060, and for maintenance of equipment, $35,995,816; total of these two items, $54,960,876.

One would think the old pike must be almost as good as new after so many millions had been spent in cobbling it up, but the job is far from done. Additional improvements already "programmed," to lapse into official jargon, will involve the further expenditure of $200,000,000. Even this will not let the company out, for a railroad, like woman's work, is never, never done.

Under any circumstances, a six-hundred-million-dollar job of reconstruction would be an extraordinary affair; but when it has to be put through while the tracks are occupied almost continuously by heavy, fast trains—for the work all had to be done

POUGHKEEPSIE'S NEW STATION, INCLUDED IN IMPROVEMENTS HERE COSTING $3,000,000, IS ALMOST COMPLETED, AND THE CITY'S ONLY GRADE-CROSSING HAS BEEN ELIMINATED

without interfering with traffic—it becomes nothing less than wonderful.

Next to the feat of replacing the Grand Central Terminal, in New York City, while it was stuffed with trains and people without so much as dropping a brick on a passenger's toe, the most difficult undertakings were those involved in four-tracking the Hudson Division.

Tough Job of Four-Tracking.

Perhaps some idea of the magnitude of this little job may be conveyed by the fact that in the five years ending with 1915, no less than $25,500,000 was expended in four-tracking and other improvements on the Hudson Division, which is equivalent to an average of $180,000 a mile for the entire distance between New York City and Albany.

But 55 of the 142 miles still have only two tracks; and, besides, the sum mentioned does not apply to the electric division, which extends to Harmon, 32 miles from New York, which absorbed $20,500,000 itself.

Besides putting in two more main-line tracks, the series of improvements involved relocating the old tracks in places, widening rock-cuts and embankments, eliminating curves and grade-crossings, building new tunnels and converting old ones into open cuts, building new bridges, new passenger and freight stations, putting in new sidings, installing a new signal system, and even providing new names for old stations.

Thus plebeian Tubbyhook has blossomed out as "Inwood"; Fishkill Landing, which sounded so vulgar and commonplace, has become "Beacon"; Catskill Station is now "Greendale," and so on. Quite refined and all that, you know.

In speaking of four-tracking the Hudson Division, it may be just as well to keep in view the fact that the New York Central already has six tracks between New York and Albany, the most easterly pair being the Harlem Division, some miles east of the river, and the most westerly pair the line still designated as the "West Shore" Railroad, which is an integral part of the New York Central, and is operated from the same offices as the parent company, under the direction of the same chief despatchers.

But six tracks are not enough to accommodate the enormous traffic. For years the company had longed for eight main-line tracks. The only way to get them was to lay them alongside the two old tracks of the original Hudson River Railroad on the eastern shore of the stream. The four-tracking project was deferred as long as possible on account of the formidable obstacles in the cañon of the Hudson.

Yes, Hudson Cañon! The walls may not be as high as those of some cañons in the Rocky Mountains, but the difficulties down at the bottom where the railroad runs are similar in kind to those encountered in cañon construction anywhere, and as great in degree.

The railroad has to fight with the river for possession of a narrow strip at the foot of precipitous hills; it has to crawl around lofty, rocky promontories, hanging on by its eyelashes, or bore through them when it cannot go around—precisely as the Canadian Pacific had to do in Fraser River Cañon, for instance.

Hudson Cañon not only possesses the conventional difficulties peculiar to its class, but it also boasts some hard problems not found in the common, or garden, variety of cañons, as befits a defile honored by the presence of a great railroad. There's the Tivoli Muskeg, for instance.

The Omnivorous Muskeg.

Many a railroad has had to wrestle with muskegs, but not in cañons.

A muskeg is a peculiar type of swamp without a bottom—or, at least, without any bottom near enough to be available in case of emergency—and just firm enough in substance to encourage the engineer to believe he can build a railroad across it, and just squashy and squdgy enough to engulf filling as fast as he dumps it in until it swallows the last shred and vestige of the company's capital and the engineer's reputation.

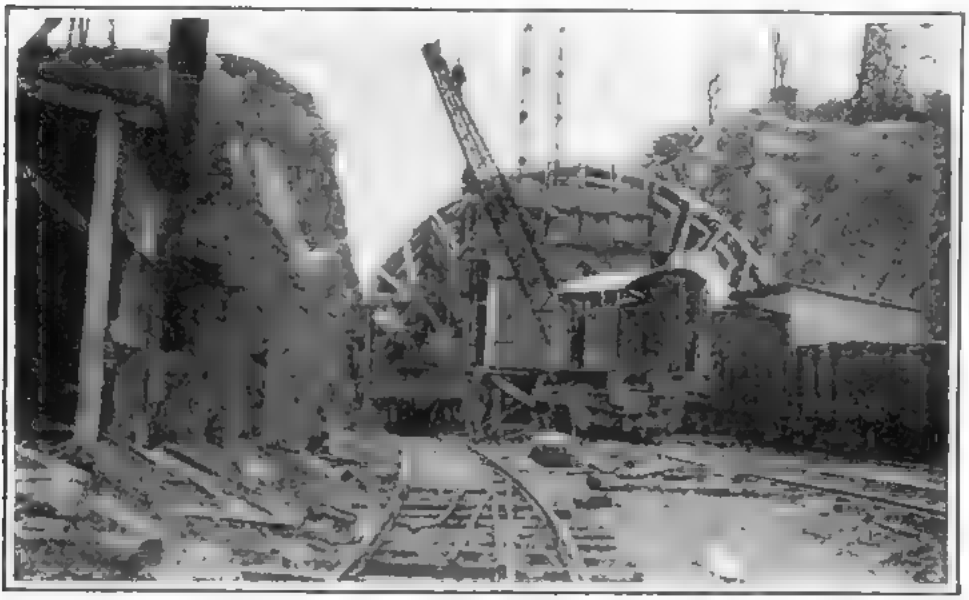
The Tivoli Muskeg is between the station of that name and Barrytown, about two-thirds of the distance from New York

City to Albany. Four and a half miles of very heavy construction for the two new tracks and of relocation for the old tracks part of the way included three miles across Tivoli Bay, which is a blind siding built by the river far back into the hills and then abandoned.

In a part of the bay where it could cause the greatest possible amount of trouble is watching for some days disclosing no signs of settling, it was decided to use the new tracks for work-trains.

Trick Tracks for Work-Trains.

About a week later a construction-train crossed as usual. On looking back, no tracks were visible; nothing but a lake wearing a sort of I-haven't-seen-yer darned-



A GOOD SLICE OF THE $25,000,000 IMPROVEMENT PIE WHICH THE CENTRAL HAS CUT ON ITS HUDSON DIVISION ALONE IN FIVE YEARS WENT FOR THE BUILDING OF CONCRETE ARCHES SUCH AS THE ONE JUST SOUTH OF RHINECLIFF SHOWN HERE IN THE PROCESS OF CONSTRUCTION

the muskeg, which is two thousand feet across.

Going around being out of the question, the engineers began hauling rock from near-by cuts and tunnels, and dumping it into the muskeg to form an embankment on which to lay the second pair of tracks.

They were doing fine when, one day, after several hundred thousand cubic yards of rock had been dumped in and the embankment was almost up to grade, the whole thing just quietly bade them adieu and started for China. At last accounts, the top of the embankment was forty feet below its original level.

The work of filling was continued as if nothing had happened until the embankment had been brought up to grade and the track laid. Careful examination and canary expression. By the judicious use of sk.ffs and lead-lines, the track was discovered under fifteen feet of water

At the third attempt the engineers were successful. The line across the muskeg has been in use for many months now, and shows no more signs of settling than the hills a mile away across the bay do.

There was a similar experience near Oscawanna, farther to the south, where the new pair of tracks was to be laid between the old line and the river. In order to find room, it was necessary to intrude upon the river.

At this point the channel shifts to the western shore, leaving a wide shoal on the eastern side, the bottom of which is a soft silt. As the filling was dumped in, this silt was forced up and out on shore; but

the settlement was so gradual that the embankment nearest the river was brought up to grade and the steel laid.

After repeated examinations, inspections, and consultations, the engineering staff agreed that it would be safe enough to risk a work-train upon it. No signs of settlement being observable after a week of daily service, it was decided to put the other track, the one on the land side of the new embankment, into use for work-trains, but not to trust it too far.

Watched Embankment Night and Day.

Relays of three watchmen at a time patrolled the new tracks day and night, punching time-clocks every half-hour to prove that they were alert. The resident engineer used to drop off a passing train at unexpected hours to see for himself that the watchmen were on the job.

These precautions were not in vain; for about seven o'clock on the evening of the third day after the second new track had been put in commission, both tracks settled between four and five feet for a distance of a hundred and fifty feet.

This blocked the road; for just north of the section of new track that had been laid in the river margin the old track passed through a short tunnel that was being relined while traffic was diverted through a new twin tunnel some thirty-five feet west of the old

This made it necessary to shift traffic from the old tracks to the new. Although the resident engineer was on the spot within half an hour after the accident, and soon had a large force of men at work, trains could not pass until 3.30 the next morning. This was the only delay on account of reconstruction that lasted more than a few minutes.

Tunnel Lined With Concrete.

The old tunnel at Oscawanna, a two-track affair, was not lined; and a tunnel that is not lined is a vexation of spirit, for it has to be continually watched and tended to make sure that no rocks take a notion to come down and smash things up.

After a tunnel has been lined with concrete, you can forget it. A concrete lining was prescribed for the old tunnel, therefore, to be administered before the new tunnel was available to take care of the traffic.

A "gauntlet," which is a double track brought so close together that it amounts to a single-line track line minus the trouble and delay of using switches at both ends, was installed in one-half of the tunnel, and a timber partition built to separate it from the other half while it was being enlarged and lined. When one side was done the gauntlet was shifted, and the remaining side was treated the same way.

At Cruger's was an old tunnel, the roof of which was only 25 feet thick, so it was converted into an open cut, which was not so simple an operation as it sounds in the telling.

As soon as the workmen began blasting fissures developed, giving fair warning that if the blasting was continued the whole roof would cave in, which would mean a blockade for days.

Blasted Off of the Roof.

A traveling platform on wheels was built to fit close up under the roof, on which men could stand and blast the rock down in small quantities. After a blast men with crowbars would work along the top, prying down loosened fragments before the muckers ventured underneath.

One day the muckers failed to wait for this preliminary work. There was a fall of rock, burying seven of them, one being killed.

Some of the work was very heavy. Three miles north of Poughkeepsie a rock cut 85 feet deep was widened to make room for the second pair of tracks by removing 90,000 cubic yards of material.

North of Tivoli, which is 98 miles from New York City, the railroad creeps around a rocky promontory which had to be sliced down to a depth of 130 feet to make room for the old tracks.

On the other side is the river, the bottom dropping away almost vertically to a depth of 70 feet.

This put all idea of a fill on the water side out of the question.

The only way to make room for the two

new tracks was to take another slice off that 130-foot cliff—and that without interfering with the running of trains, remember. By starting in on the land side at one end of the cut and using great precautions, the engineers got away with it.

There have been times when running trains through a cañon with deep water beside the track at intervals has had its disagreeable features. One of these occasions was on October 24, 1897.

At dawn that morning Train No. 46, while skirting the margin of one of these pools near Garrison, found a spot where the action of the waves had undermined the embankment, which gave way, precipitating the engine and six of the nine cars into deep water. The engine went completely out of sight, but the cars either hung partly on the embankment, or dropped their trucks and remained afloat.

Caged in a Submerged Car.

One of the latter was the composite car, which was flung some fifty feet from shore and submerged up to the bottom of the ventilators in the roof.

The baggage-master and several others who were in the car contrived by climbing up on trunks to keep their faces at the ventilator openings, where they escaped drowning for the moment, although they were in imminent peril.

One of the passengers in the sleepers that stuck to the rails was William S. Langford, then a young clerk in the treasurer's office, now insurance expert for the American International Corporation. Langford was dazed by the shock for a moment, but not otherwise hurt. He quickly recovered, and began to look around.

The first thing he saw was the plight of the people in the composite car. He was already undressed, ready for the water; so, breaking open the glass-covered tool-case in the sleeper, he seized an ax, swam out to the composite car, and chopped a hole in the roof, through which, with the aid of others who had arrived by this time, the occupants were dragged just in time to save their lives.

In the excitement of the moment no one stopped to count the number rescued through the hole Langford chopped in the roof; but, anyway, the board of directors heard about the way one of their own employees had treated the company's property, so they held a little private session on the matter.

One day after Langford had got done shivering over the memory of that early morning cold plunge, and anticipations of what would happen to him for the things he did to that car, he was summoned into the office of Chauncey M. Depew, who was then president of the road.

President Depew made a speech at the poor clerk about the car he had chopped up, but softened the blow by presenting him a gold medal which the board of directors had voted him as a token of their appreciation of his heroic conduct at the Garrison wreck.

A tug which came wandering by soon after the train went into the river was hired to stick around on the chance that it might be useful in riding herd on those amphibious cars.

Tug Salvaged the Express.

This proved to be a wise precaution; for presently the express-car dropped its trucks and stampeded, heading down-stream. Some express-company officials who had arrived by this time seemed to be a great deal more excited than the tug captain thought the circumstances warranted; but still he chased after the car, lassoed it with a hawser, and soon had it hog-tied in shallow water a couple of miles below.

Still exhibiting symptoms of imminent heart-failure, to the infinite disgust of the tug captain, the express people came loping down to where the car lay, sloshed around until they got the safe ashore, and with trembling fingers opened it.

Then it was the tug captain's turn to have heart-failure. His eyes stuck out until you could have used 'em for hat-pegs as he watched the express people dig out of the safe greenbacks enough to stuff a mattress.

Being something of an admiralty lawyer himself, the captain knew that the moment that car abandoned family and friends and got out into navigable water it ceased to be

ON ACCOUNT OF THE MANY DIFFICULTIES ENCOUNTERED IN THE VICINITY OF DUGAN'S BRIDGE, THE ST ANDREWS CUT, TAKING AWAY 90,000 CUBIC YARDS OF MATERIAL, THAT ROSE TO A HEIGHT OF 85 FEET ABOVE THE TRACK, WAS NECESSARY IN FOUR-TRACKING THE REGION NORTH OF POUGHKEEPSIE.

a car and became a derelict; and that if he had not been so blamed eager to hire out by the day to the railroad company, the law would have allotted him a most generous share of the $240,000 in the safe as salvage for his services in rescuing the car. Being an honest man, and also being unable to help himself, the captain accepted his measly day's wages and called it square instead of salvage money enough to have

AT OSCAWANNA (NEW YORK) A NEW TWIN TUNNEL HAS BEEN ERECTED, ABOUT 35 MILES WEST OF THE OLD—AN UNLINED TWO-TRACK AFFAIR THAT REQUIRED CONTINUAL WATCHING.

set him up in business as a retired capitalist. But the blow almost killed father.

But we were talking about four-tracking the Hudson Division. The engineers found opportunity to pull off a good many original stunts in the course of this work. One was two miles north of Rhinecliff, which is eighty-eight miles from New York.

Unique Tunnel Under Astor Property.

Here the old track passed under a part of Vincent Astor's property by means of a double-track tunnel. The line was relocated and a four-track tunnel, with twenty-one feet clearance, the only one of the kind in the United States, was driven.

This section of the road grew engineering problems as thick as blackberries in August. North of Staatsburg, which is the next station south of Rhinecliff, it was necessary to do a little grade-revision, lowering the old tracks, besides building the new.

The ground was as unstable and shifty as a mixture of clay and quicksand could make it. A timber platform half a mile long for one set of tracks and a concrete slab of the same length for the other set settled that difficulty.

At Hyde Park, north of Poughkeepsie, a new station was built with a subway for passengers beneath the tracks, that is five feet below the level of the water in the Hudson a few rods away.

At Poughkeepsie, improvements to cost $3,600,000 include a new station, now a little more than two-thirds completed, new retaining walls and the elimination of the only grade-crossing in the city.

South of Poughkeepsie, between Storm King and Chelsea, for a distance of eight miles, there are a lot of brick-yards, to give access to which eighteen grade-crossings have been replaced by subways.

Near Beacon, fifty-eight miles from New York, there used to be seven heavy curves, all of which have been straightened out.

At Beacon a new passenger-station has been built on a foundation which, on account of the uncertain nature of the ground, had to be laid on piles driven from fifty to seventy-five feet into the ground.

The subway under the tracks is three feet below the level of the water in the river.

The most spectacular of all the engineering feats between Albany and New York was performed in 1916 on the west side of the river on the West Shore tracks.

Just below Highland Falls the railroad skirts the base of a very high and almost vertical cliff on a shelf barely wide enough for the two tracks.

Right on the face of the cliff is a through truss bridge, not across a stream, but over a great crevice in the bottom of the Hudson River that, being too deep to fill, had to be bridged.

Right above and almost touching the bridge hung a slab of granite 200 feet long, 100 feet wide and from 5 to 8 feet thick, the weight of which was estimated at 6,000 tons.

When the railroad was built this slab seemed to be securely attached to the cliff. But the action of the elements in the course of years had loosened it up until it threatened to slide down at any moment, of course carrying away the bridge and blocking the road for months if, indeed, it did not cause loss of life.

There was no possible way to remove the slab without destroying the bridge, so the engineers decided upon the daring expedient of pinning it in place.

Nailing Granite in Place.

Drills were mounted on the top of the bridge with which ten holes 11 inches in diameter were drilled through the slab and deep into the face of the cliff at an angle of 60 degrees.

Into these holes steel pins 11 inches in diameter and from 11 to 20 feet long were driven, the interstices were filled with cement and the heads of the pins carefully protected with cement and tar to prevent moisture getting in.

Now that granite slab is as secure in its place as ever it was. This is said to be the first time such a scheme has ever been tried.

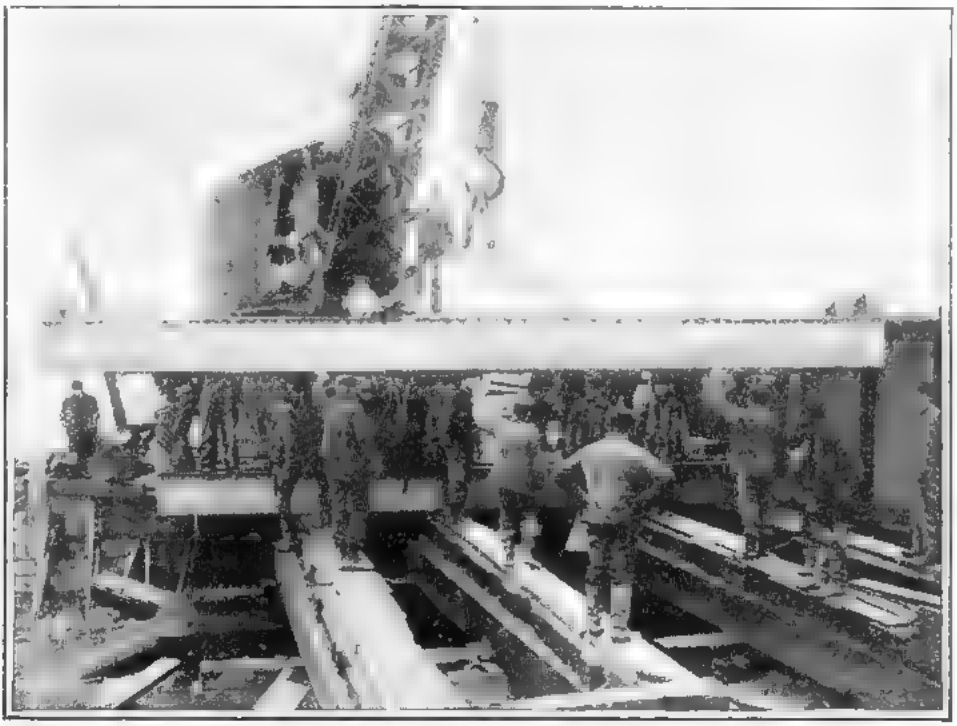
The engineers had a rather long session at this point. After the granite slab had been disposed of it was found necessary to strengthen the bridge by putting new supports under the middle of each span.

The bridge was amply strong for the days in which it was built, but the weight of locomotives and cars has vastly increased since then, as you may have heard.

As has been explained, the situation of the bridge made it impossible to get under it from the land side, so the only way open was to moor floats beneath the bridge on which drills were mounted to punch holes raised for a distance of two miles and a new station built, at a cost of $2,000,000

This track-elevation included raising a bridge over the Erie Canal eight feet. Hydraulic jacks were placed under all bearing points of the bridge and worked in unison on signal for each lift.

Then the bridge would be blocked up temporarily while the embankment was



JUGGLING MAMMOTH STEEL GIRDERS IN ORDER TO GIVE THE SCHUYLER JUNCTION BRIDGE A NEW FLOOR SYSTEM WAS ONLY ONE OF THE MANY STUNTS IN THE $600,000,000 CONSTRUCTION JOB CARRIED ON WHILE TRAFFIC MOVED AS USUAL.

in the sloping granite bottom of the river, one at a time.

When all the holes had been drilled reenforced concrete columns were built into them and then up to the bridge, where they were adjusted to bear their proper share of the load.

5 Main-Line Tracks at Schenectady.

Improvements were by no means confined to the section of the road between New York City and Albany. At Schenectady, seventeen miles west of Albany, five main-line tracks of the New York Central and two of the Delaware and Hudson were brought up; then there would be another lift on the bridge. No trains were ever delayed on the Schenectady improvement; and street-cars in the city were delayed but once, from midnight to five o'clock in the morning.

At Utica the railroad people found that Nature had sadly misplaced the Mohawk River.

So they dug a new channel for it two thousand feet to the northward, where it should have been in the first place, picked the river up and tucked it in its little bed and carted the material dug out of the new channel back to fill up the old one and

built additional yard-tracks upon the made ground.

This little job included building a large capacity intercepting sewer under passenger and freight-yards and a mile east of the station. A new passenger station and seventy-stall roundhouse were also built, for Utica is the junction with the Adirondack Division. Also it is headquarters for the "dog-catchers."

Has a "Dog-Catching Outfit."

For the New York Central is the only railroad on earth that maintains a dog-catching-outfit. Under the laws of the sovereign State of New York the railroad may legally operate coal-burning locomotives in the North Woods between the hours of 8 P.M. and 8 A.M, when the dew is supposed to be heavy enough to avert danger of sparks from the locomotives setting forest fires.

But on the stroke of eight in the morning the coal-burners have to come to anchor wherever they may be and the railroad has to send out a "dog-catcher," which is the name given oil-burning relief engines, to bring in the trains.

Near Rome, which is 100 miles west of Albany, the line crosses the Barge Canal—or would have done so if it had stuck to its original location.

But as this would have involved the construction of two four-track bridges at the almost impossible skew of 37 degrees, it was decided to relocate the main line and thus avoid not merely the skew bridges but also the old line through the heart of the city, which included a sharp curve.

So a new line twenty thousand feet long was built. The embankment contains 1,800,000 cubic yards of material and eliminates eight grade-crossings. A new station was built at Rome.

Rochester, a city of a quarter of a million inhabitants, has a costly new station, used by all trains on the main line and three branches, with eleven station-tracks, two through tracks for passenger and two for freight trains.

The company is spending $600,000 for improvements at Niagara Falls, and plans a passenger station for Buffalo to cost several million dollars. The Gardenville yard, described in a former article, will cost $10,000,000.

At Erie, 88 miles west of Buffalo, a grade-crossing scheme, to cost $1,600,000, is under way. At Ashtabula a system of steel-car shops to cost $1,000,000 are being built.

At Cleveland, $350,000 is being devoted to the elimination of grade-crossings; and when certain little preliminaries are settled, a good many more millions are to be expended in building a new passenger station.

At Elyria, $1,500,000, and at Sandusky, $170,000, is being devoted to the elimination of grade-crossings.

At Port Clinton, Ohio, relocation of line and grade-crossing elimination will set the company back $1,250,000. Big yards and engine terminals, now almost completed, at Air Line Junction, near Toledo, will cost $3,000,000.

New shops are under way at Elkhart that will cost, when completed, $2,000,000. Track-elevation in Chicago, now practically finished, will cost the neat little total of $7,000,000.

The Chicago improvements include a smoke-washery at Englewood roundhouse, where the smoke from a hundred locomotives a day is laundered to suit the exacting requirements of the city ordinances. This thirty-stall roundhouse is the only one in existence without a smokejack.

Instead of smokejacks a 60-inch smoke-duct extends entirely around the house just under the roof with drop-pipes and telescope jacks to fit tight over the locomotive smokestacks.

Turning Smoke into Salable Solids.

A 78-inch fan driven by a 300 horse-power motor capable of collecting 68,000 cubic feet of gases per minute takes all the smoke from the locomotives and delivers it to a combination of tanks of water, agitators, sprays and steam-jets and turns it loose at last from the top of a tall chimney in the form of an odorless white vapor.

Each ten locomotives given the smoke cure yield a barrel of carbon and stuff, the exact analysis being carbon 82.6 per cent, sulfur 2.6, iron oxid 8.7 and silica 1.8

UNDER VINCENT ASTOR'S PROPERTY, NEAR RHINECLIFF, NEW YORK, WAS DRIVEN THE ONLY FOUR-TRACK TUNNEL IN THE WORLD. IT HAS A 21 FOOT CLEARANCE

SIX OF THE NINE CARS WERE PRECIPITATED INTO THE WATER, THE COMPOSITE CAR FLUNG 50 FEET FROM SHORE AND SUBMERGED ALMOST TO THE ROOF, AND THE ENGINE LOST ALTOGETHER WHEN TRAIN NO. 46 STRUCK A SNAG NEAR GARRISON, NEW YORK, IN THE FALL OF 1897

per cent. The plant cost $15,000 and the expenses of operating it is $7.19 a day.

But the interesting part of the thing is that the railroad people expect to be able to sell this stuff at a price that will show an actual profit on the operation of the plant.

The foregoing items but hit some of the high spots in the railroad's desperate endeavors to keep its head above the rising flood of traffic. There are other things it would do if it could, but a railroad company may not spend its own money as it would, but only as others permit.

One of the things the company wanted to do was to eliminate a certain grade-crossing at Tarrytown, 24 miles north of New York City. There was the usual delay while village authorities, commissions and so on talked the proposition over.

Moral: Help Eliminate Grade-Crossings.

At one of the public hearings a citizen appeared to oppose the improvement. He thought it a dreadful thing that the village should be asked to bear a portion of the expense.

The very next day this citizen, running to catch a train, was struck by another train and instantly killed on this very crossing, the elimination of which he had opposed.

Possibly this incident deserves to be called a case of poetic retribution. Whether it does or not, some wicked persons have been heard to wish that the New York Legislature might be induced to run on a grade-crossing just as the Empire State express was due.

One of many justifications for this wish may be found in the legislation by which the Castleton Cut-Off project was killed at the 1917 session.

The railroad has been scheming for the last ten years to get this $20,000,000 improvement under way. The line never should have been built through Albany; but it was located at the beginning of the railroad era, when no one had any conception of what the requirements would be, and it has grown up with the country, facilities being added piecemeal.

But the limit of development was reached long ago. Albany has become a dam which places an arbitrary limit on the volume of traffic that shall flow east and west; and this arbitrary limit affects, not merely the New York Central, but the New Haven and Delaware and Hudson also; not merely the people of New York City, but those of New England as well.

The congestion at Albany is due to various causes. One is the drawbridges across the Hudson, one for freight, the other for passenger trains. During the navigation season the freight draw is opened an average of thirty-eight times in twenty-four hours for periods of five to seven minutes at a time. This, of course, places an absolute limit on the train-movements.

Another cause is the limited yard-facilities at Albany and the lack of room to extend them, and the heavy grade getting up out of the Hudson Valley, the total rise being three hundred feet in eight miles, the maximum grade being ninety feet to the mile in spots.

Ten pusher engines, each with three crews under present laws, are required to help trains up this hill at a cost of more than two hundred thousand dollars a year.

The lack of adequate yard-facilities is a very serious drawback. The most easterly place at which freight is separated to go down the east or west shores of the Hudson is at East Syracuse, 149 miles west of Albany.

In cases of blockades or vessels about to leave, this may mean expensive lighterage at New York, or the freight may be shut out from the vessel altogether.

The Castleton Cut-Off Dream.

The Castleton Cut-Off was designed to eliminate all these troubles by building a double-track main line twenty miles long, connecting the Hudson Division and the Boston and Albany with the main line west of Albany by means of a high bridge at Castleton, ten miles below the capital city, and constructing immense classification yards at Feura Bush, eight miles southwest of Albany.

The project was approved by Army engineers, Congress had passed two bills providing for its construction, the Legislature

BY HIS QUICK WIT AND PRESENCE OF MIND WILLIAM S. LANGFORD SAVED THE LIVES OF MANY PERSONS IN THE FAMOUS GARRISON WRECK.

had passed an enabling act and Secretary of War Baker had held a number of hearings on it.

The company had sent out a field force to buy the necessary real estate, and all seemed to be going as merry as a marriage bell, when the Legislature, near the close of its last session, passed a bill which the Governor signed providing that the bridge should be built in one span of a thousand feet, from shore to shore, instead of with a pier in the river-bed, but with a span of six hundred feet over the navigable channel.

This was equivalent to revoking the charter; and the improvement, which would have been of immense benefit to millions of people, will not be built.

Another improvement that has been under discussion for years is intended to cover up the tracks along the Hudson in New York and give the city a park reaching the water's edge. At a cost of $50,000,000 the railroad proposed to take its tracks out of the streets in lower New York and at the same time remove various other sources of complaint.

Incidentally it would have opened up a line of approach by means of a cross-town tunnel with Grand Central Terminal, the outlet to the north for which has reached the limit of possible development.

The negotiations with the city authorities seemed to have almost reached a satisfactory conclusion and the railroad was prepared to begin work, when the Legislature spilled the beans.

But anyway enough has been done to justify the prediction of Commodore Vanderbilt when he was trying to coax Chauncey M. Depew, a young lawyer, to give up the practise he didn't have and go to work for the company. Said Commodore Vanderbilt:

"The business of the future in this country is railroading."

GOOD ADVICE.

BY MARGARET G. HAYS.

IF you haven't a cent in your pocket,
If you haven't a credit in bank,
If there's no word of praise in your docket,
Don't be a misanthropic crank.
Just look for a job with a grin, boy;
For all have a merry retort,
Good luck will come rollicking in, boy;
Brace up! Try again! Be a sport!

SEVEN SECTIONS OF SIX.

BY ARTHUR LAKEWOOD.

Joe Curtis and His Night Yard Crew at Eagle Rock "Do Their Bit."

SCENE—D. & P. Yard Office at Eagle Rock.

TIME—The Present.

HOUR—Night.

(*Joe Curtis, Night Yardmaster, enters to take charge for his shift.*)

YARDMASTER MILLER (*to Curtis*)—There's your lists and engine line-up. Sullivan's gone down to switch the rip-track. Looks pretty smoky to-night, Joe. The 6 P.M. report shows a bunch of freights coming from both ways, and there'll be four sections of No. 6. Well, I'll leave it with you.

CURTIS—All right, old head; let them come, we were here first. (*To himself*) So Sully's here early and has the bunch working the rip. That man is one dandy railroader. He's getting lined up for this mess that's coming. Too bad that fellow is a confirmed grouch.

GEORGE (*the yard clerk*)—I see by this message-file that there's two gons derailed on track No. 5, so we can't use that to-night unless we work from both ends.

CURTIS—Those things always go with a night like this. Let me look through that file; probably that's not all that's wrong. We might as well have the whole thing at one dose. (*Looks over file of telegrams.*) Here we are. West leg of the wye is out of commission on account of the trestle over the creek being renewed. That's all I see to cause us worry so far, but that's enough!

(*Harry, the callboy enters, whistling noisily.*)

HARRY—Good mornin', fellers. This is mornin' to us, ain't it? It's goin' to be a rainy day, too; starting to drizzle right now. Gee! I slept like *Rip Van Winkle* to-day.

Say, Joe, I passed Sully down on the long storage bringing a cut of empties over from the rip. He yelled at me to tell you No. 5 ought to be fixed so we can use it to-night. They were switchin' with a hog.

GEORGE (*hurriedly*)—That's right, Joe; the switch-engine's in the shop for the night. I forgot to tell you. Here's a note about that.

CURTIS—You'd forget to eat your meals if your stomach didn't get to hurting you! Well, that makes three flies in the ointment. Grief always comes in bunches. Leaky flues again, I suppose; and the day-engine has a broken driver; can't figure on that. Fine night to have both goats tied up. Let's hope that's the end of our trouble list.

(*Dick Daniels, the eccentric singing switchman, enters, shaking rain from his clothes.*)

HARRY—How do you like the weather, Dick?"

DICK (*sings*)—"It is not raining rain to me; it's raining daffodils." Say, what's the four sections of 6, Joe?

CURTIS—First's regular, second's overflow, third's three lights coupled to protect bananas and west manifest to-morrow, fourth's a troop-train.

OPERATOR (*to Curtis*)—Despatcher says you can figure on another section of No. 6—more troops. There'll be a deadhead caboose and crew and doublehead engine in on No. 7 to protect them

CURTIS—Wonder they don't wait until a train gets into the yard before they notify us'

(*Engine Foreman Sullivan enters, growling.*)

SULLIVAN—Woof! This is some night! Some yard to work in! Some engine to work with! Some blasted excuse for a railroad that has their switch-engines in the shop when the rush is on and makes us switch with a road engine! If I hadn't gone crazy long ago a worrying over this rotten job of mine I'd know enough to quit.

DICK (*sings*)—"Good-by, Honey, I'm gone!" Sully'll be right here switching box cars when they're running all the passenger trains in the air!

CURTIS—Listen, you fellows. There's another section of No. 6 coming; just got notice of it. Cut the deadhead caboose off No. 7 to protect them.

(*Parker, the boomer operator on the day-shift who loves to spin yarns, enters, followed by two brakemen.*)

PARKER—Hello, boys! What is this; the work house or the insane asylum? Gentlemen of the jury, I submit to you the case of an innocent pounder of brass, the victim of base injustice. These two insects just stung me for four bits' worth of bum cigars! I—

CURTIS—I don't want to throw you guys out in the rain, but I'll do it if you don't sit down and shut up. We can't have—

PARKER—All right, all right, old top. Anything you say goes.

(*The three take chairs in a corner of the office. No. 7 and an extra east whistle into the yard.*)

CURTIS—Dick, give that extra a high-ball to come along down.

DICK (*rushing about hurriedly*)—Where's my gloves? Where's my gloves? (*Finds them and rushes out, followed by the yard crew.*)

HARRY—What you know about that guy? He can't do a thing without his gloves on. He's just like a near-sighted gink without his glasses. None better, though, when he has those gloves on.

OPERATOR Despatcher says O. K. for extra east for 2.00 A.M.

CURTIS (*glancing at his watch*)—Harry, you'll have to get busy; that's a short call.

OPERATOR—Here's some more good news, Joe.

CURTIS (*reading message*)—"Two additional sections of No. 6, making seven in all. Last three troop-trains of nine cars each. Run them upon arrival." Now what do you think of that? (*Examines engine line-up.*) We're shy two engines and crews. Ask him how about that.

OPERATOR—Says he'll ask the J. A. Division to loan us an engine and crew and you'll have to use the local outfit on one of them.

CURTIS—That'll be nice, too! The east local is made up on No. 3. There will be no chance to clear track No. 3 to-night, then. (*To George, who is staring open-mouthed*)—Get Ellis on the phone and tell him he'll have to rerail those cars on 5 to-night. We're using the local engine and crew on sixth No. 6 and can't clear track 3. We're going to need No. 5 sure before morning.

PARKER (*to his interested brakemen friends*)—Well, this tallow-pot was making his first passenger trip on No. 8 with old Dad Kelly. He was pretty nervous and was trying hard to please the old man. Dad told him to look out for the mail-cranes, being afraid he'd get his brains knocked out. At the end of the run Dad looked back in the coal tank and saw about twenty pouches of mail. Says Dad:

"What the ripping Cornelius is all this?"

"I got the pouches off of every crane but two," says the tallow-pot! (*Loud laughter from the corner.*)

CURTIS—Say, you overworked slaves of a soulless corporation, what do you think this is? Less noise and more order or get out.

(*Yard crew enter and surround the stove to dry their clothing.*)

SULLIVAN—Great night for ducks! That extra's out, Joe; how about the east local? We oughta get No. 3 clear for those west manifests.

CURTIS—No chance. Two more sections of No. 6 coming up. Using local crew on sixth section and trying to get help from Red Point to handle the seventh.

SULLIVAN—Two more! Fer the love of Mike! I suppose, Joe, 'at you know there's two worn and weary gons reposin' on the ground in the middle of track No. 5?

CURTIS—I do, yes; and I just called

Ellis out to put them on. Didn't consult Smoky Forks, either. We've got to have that track, that's all.

OPERATOR—Red Point says no engines to spare. Says if Smoky Forks can't run this district to turn it over to them and they'll run it.

CURTIS (*with blood in his eye*)—Now who do you suppose sent that reply? Pretty raw when we've made a regular practise of loaning them power and crews! Send this. (*Files a message to the "Old Man" [Superintendent].*) I guess that'll bring them.

SULLIVAN (*sourly*)—I suppose those sixes are more troops going from Captain Somebody to Captain Somebody from Somewhere to Somewhere. That makes me tired! Wonder if they think we're spies for the Kaiser!

CURTIS—They're taking no chances.

(*Sullivan takes his lunch to a corner of the office, turns his back and proceeds to transfer the contents of his dinner-pail to his hungry stomach.*)

HARRY—This is the insane ward all right, all right! There's another nut! What you know about a gink that can't eat when anybody's watchin' him? I'm beginnin' to get queer myself, associatin' with this bunch!

CURTIS—Talk less and think more, kid. I'll have calls for you on third and fourth No. 6 in a minute. (*To the engine foreman.*) First and second will be in here right together. We'll put them both through No. 1, Sully.

OPERATOR—Message from A. R. W. here says he has arranged to have Red Point loan us an engine and crew for seventh No. 6. That lines up that layout.

(*Yard crew file out into the rain.*)

DICK (*singing*)—"Wait till the sun shines, Nellie, and the clouds—"

CURTIS—Operator, submit calls on third and fourth No. 6 for 4 o'clock and 4.15 A.M., also a drag west for 4.30 A.M.

GEORGE—Ellis says they'll put those cars on in the morning. Can't do anything with 'em to-night in this storm.

CURTIS—Looks like everybody's bucking to-night except Dick, the genial songster. Let me have him. (*Takes phone from George.*)

CURTIS (*at phone*)—Hello! Ellis? — Yes, and listen! We are handling seven sections of No. 6 through here to-night—four of 'em troop-trains—and we are going to get them through without delay, too. Using local crew on one of them so can't move the local off No. 3. If we don't get No. 5 we are going to be blocked and these troops are going to be delayed. What's that? Listen! I've no time to argue with you, Ellis. I want No. 5 cleared and I want it done quick! I don't want to take it up with Smoky Forks, but I'll do it if necessary—All right, that sounds better. What time? —All right, Ellis, thanks.

PARKER (*still entertaining brakemen*)—When I fell off that sixty-foot derrick I saw that if I could divert my fall about three feet I might light on top of a box-car. If I couldn't I'd hit the ground and smash like a rotten tomato. I wiggled and pawed the air frantically and managed to light on my feet on the car roof. I shot right through and came up standing on the car floor, unhurt except that my elbow joint was dislocated!

BRAKEMAN—Your elbow joint? How did that happen?

PARKER—Wiggled it out of joint coming down!

(*Boisterous laughter from the corner.*)

CURTIS—Third call, boys. This is a yard office, not a club-room. Beat it out of here!

(*Parker and his pals depart. Sullivan, who has been making up the drag west, enters.*)

SULLIVAN—Ellis is out there putting on those gons, but his crane is blocking track No. 4 and he says he won't be through for an hour. Looks like a delay to some of the sixes. Nothing ever goes right in this yard, and

CURTIS—Let's see. Pull the long storage and shove that stuff up on the east leg of the wye. That will let the fifth and sixth sections go and he'll be through by that time.

SULLIVAN—The long storage! Those 104 empties! I'm thirty-eight years old, but I'm ding-danged if I don't enlist if they'll take me! This job gets worse every night. We ain't had a decent shift

in six weeks. (*Goes out grumbling to himself.*)

CURTIS—That bird will have those 104 empty reefers on the wye inside of fifteen minutes and be looking for something else to do—some yard man! Every one has a right to their own opinion, and it's mine that he can help Uncle Sam ten times as much where he is as he could in the trenches.

(*Three hours later Harry, the caller, enters, mud-spattered and bloody-nosed.*)

HARRY (*to George*)—Your Royal Yard Clerkship, I have the honor to report that the seventh section of train No. 6, consisting of nine cars of soldier boys for Somewhere in the United States, now rolls merrily eastward. Also, and in addition thereto, I've called crews for eight of the D. & P.'s freight trains this night. I say it has been some night!

GEORGE—If that's the case, what in the name of the General Car Accountant ails your nose and the rest of you?

HARRY—Nothing at all; nothing at all. Boss Joe was down there in the rain threatening to fire the whole works if they failed to get seventh No. 6 out on call. The others was all busy and he told me to beat it and open the east switch on track No. 5 to let No. 422 out of the way. When Joe says, "Beat it!" like he did then, I don't ask no questions; I just beat it! My glim went out and my nose had a head-ender with a switch-stand.

(*Curtis and entire crew enter, weary and covered with mud as daylight breaks.*)

HARRY—Make way for General Joe Curtis and his staff!

OPERATOR—I got a pail of hot coffee here that I mooched off the repair-outfit cook. Come on and go to it, you fellows. You look like you need it!

CURTIS—You're a man after my own heart! That's a drink we'll not refuse. Here's your health, boys.

(*Harry shoulders up to Curtis importantly.*)

HARRY—Show me the same number of men who have done any more for Uncle Sam than we have to-night.

(*All partake of the steaming beverage. Day yard force enters.*)

SULLIVAN—Look who's here! Let's roll our hoop, Dick.

(*Sullivan takes Dick by the arm and they march out into the storm.*)

DICK (*singing*)—"Where do we go from here?"

HARRY (*yelling after them*)—Better go straight home if you know what's good for you.

CURTIS—No need to worry over that pair. They'll do that."

RETRIBUTIVE.

BY WILSON NIXON.

WE laugh at our remembered frowns,
And smile on by-gone sorrow;
For tear-drops are but ghostly clowns,
That grin at us to-morrow.

The roses live a little while,
But perfume lingers after;
A sigh is just an echoed smile,
And tears but longed-for laughter.

THE SLANGLESS RAILROAD.

BY FRANK GILBERT ROE.

A number of us in a railroad bunk-house in western Canada were recently assured by a gentleman from Chicago—an old railroad man—that "you don't hear this slang on the American roads." We should be glad to have this statement corroborated by American railroad readers.—AUTHOR.

THEY tell me there are roads where slang is never heard at all;
Where no one speaks of "wheeling 'em," or claims to "hit the ball."
They always say "conductor," there, instead of "cap" or "con,"
And "All right, engineer; proceed!" not "Highball, bo; we're gone!"

They never "jump the iron" there (they're sometimes off the track);
They always say "caboose" instead of "dog-house," "crummy," "hack."
The "O R. C.'s" and "tail-end shacks" don't "flip 'em" "on the fly;"
The "hoghead" never "soaks her," and the "snakes" do not "go high."

The "smoky" doesn't "keep her hot;" they don't "get out o' town;"
You never hear an "old head" say: "That student threw me down."
They speak of "locomotives" there—they've no such word as "hog;"
No "tallowpot" will ever growl: "She don't know how to fog."

They've nothing else but "engineers" and "firemen" in the cab;
No "train-delayer" ever hands the "scissor-bills" a "stab."
No "diamond-juggler" says: "The pig is eating from my hand;"
And though men often get discharged, there's none "let out," or "canned."

They call them "running switches" there they never mention "drops;"
"Air-brakes," "injectors," "safety valves"—not "wind," and "guns," and "pops."
No "kickers," "goats," or "varnished cars;" no "drifting" through the "sags;"
They never "wash the hogger out," or "dynamite" the "drags."

No "Big E's," "car-loads," "stingers," and it's "switchmen" there—not "snakes;"
No "twist 'em up," or "tie 'em down;" but "mind you set the brakes!"
No man would ever say "Unload!"—not even at a wreck;
Or "pull the pin" because they "set the wind" upon his check.

And since they don't indulge in slang, they never have to cope
With the nine interpretations of that one expression "dope."
Alas! Alack! With men like these I'm driven to declare
I shouldn't be surprised to hear they never even swear!

LOOKING BACK ON SOUTHERN RAILS.

Thirty-Eight Different Types Used Since 1835 on the Steam Carrier Below Mason and Dixon's Line.

SINCE the days of the old South Carolina Canal and Railroad Company of 1835, no less than thirty-eight different kinds of rail have been used on the lines that now compose the Southern system. Just what progress has been made in this development, which started with the strap or stringer type, laid on wooden stringers without coupling, is illustrated in a most interesting chart, showing a collection made by Mr. B. Herman, chief engineer, in charge of maintenance of way and structures, Lines East, and which we have secured through the courtesy of the "Southern News Bulletin."

A cross-section view of each rail in the collection is given in the illustration on the page opposite, and accompanying it, is a short history of each type, the numbers corresponding to those shown on the rails in the photograph.

1. Strap or Stringer Rail.—Length of service unknown. Laid between Charleston and Branchville, South Carolina, by the old South Carolina Canal and Railroad Company about 1835, on wooden stringers and without couplings.

2. Stringer Rail.—Replaced Rail No. 1 between Charleston and Branchville, date of laying and length of service unknown.

3. Stringer Rail.—Used between Charlotte and Columbia in the track of the old Charlotte and South Carolina Railroad, built in 1846 and 1852. This rail was transferred to the Winston-Salem division where it was used until 1871. Rail weighs about 33 pounds per yard and was spiked to 7x7-inch stringers which were doweled to ties by white oak pins.

4. Stringer Rail.—Laid in the track built in 1856 to 1871 by the old Macon and Brunswick Railroad between Macon and Brunswick, Georgia. Released about 1878. The rails were 24 feet long and spiked to 7x8-inch stringers doweled to 6x8-inch and 6x9-inch by 9-foot dapped ties, spaced about 4 feet apart.

5. Hollow U-Shaped Rail.—Invented in the United States by Strickland in 1834, weighs 40 pounds per yard and was 10 to 20 feet long. Supposed to have been used between Alexandria and Orange, Virginia, when the old Orange and Alexandria Railroad was built in 1848 to 1852, and relaid in side tracks and yards after 1874. The specimen was taken from Alexandria Shop Yard in December 1914.

6. Hollow U-Shaped Rail.—Replaced Rail No. 2 between Charleston and Augusta. Date of laying and length of service unknown.

7. T-Rail.—Weight 40 pounds per yard. Made in lengths of 18 to 24 feet. Used in the main track of the Washington Division as late as 1875. The date of laying is unknown.

8. Pear-Shaped Rail.—Weight 45 pounds per yard. Laid just after the Civil War by the Atlanta, Tennessee and Ohio Railroad between Charlotte and Statesville, North Carolina, and entirely released in 1896.

9. Pear-Shaped Rail.—Laid with chairs as shown by the specimen. Replaced Rail No. 6 between Charleston and Augusta. Date of laying, length of service and weight unknown.

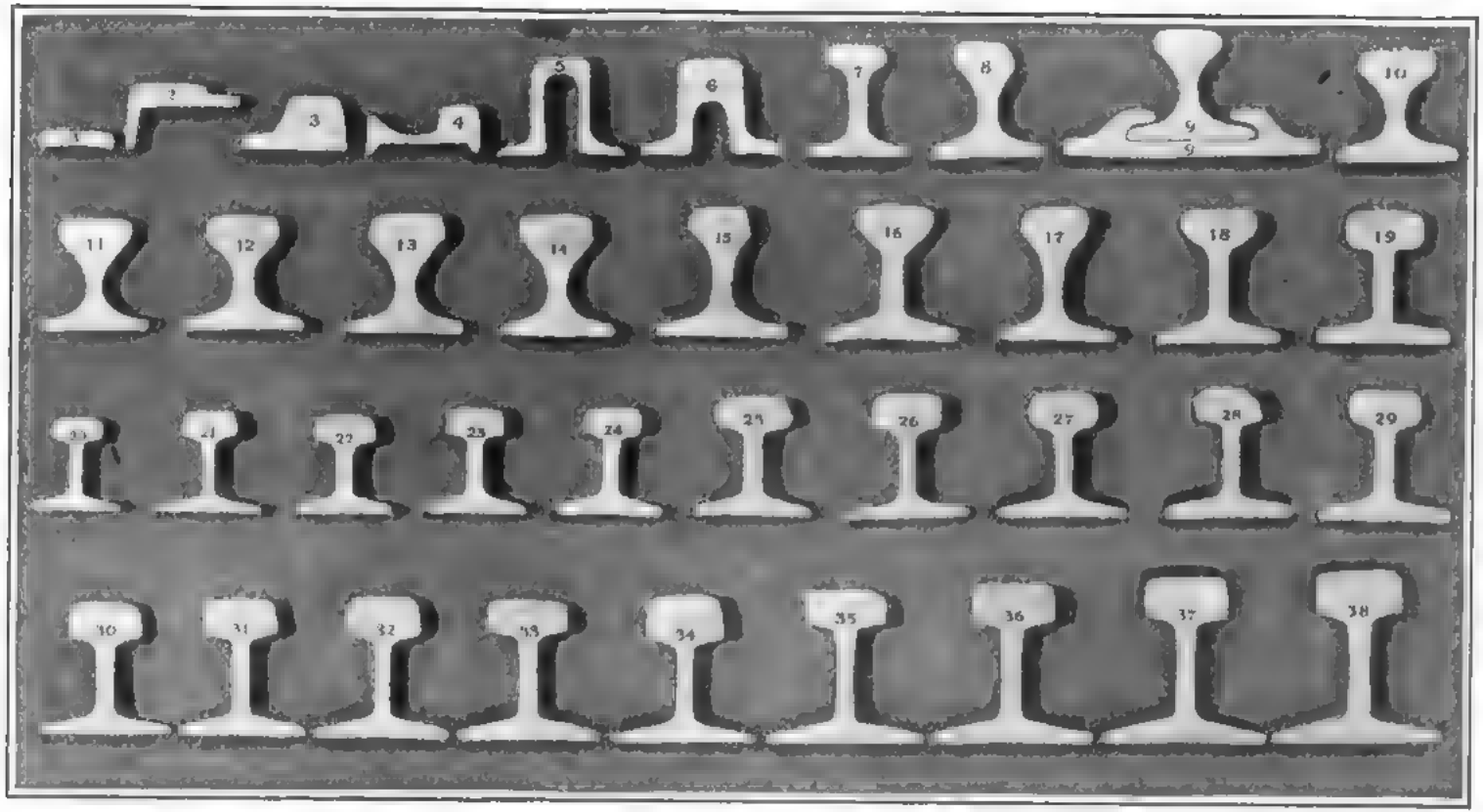
10. Pear-Shaped Rail.—Released from service on side track, Birmingham division. Date of laying, length of service and weight unknown.

11. Pear-Shaped English Rail.—Weight about 50 pounds, "John Brown." Laid about 1880 between Strasburg and Harrisonburg, Virginia. Length of service unknown.

12. Pear-Shaped Rail.—Marked "50-lb., A. T. Co., 1867." Released from Charlotte division. Original location and length of service unknown.

13. Pear-Shaped Rail.—Marked "56-lb., John Brown, August, 1873." Released from Charlotte division. Original location and length of service unknown.

14. Pear-Shaped Rail.—Marked "56-lb., John Brown, 1872." Probably laid first on the Asheville division.



TYPES THAT HAVE MADE RAIL HISTORY IN THE LAST 82 YEARS

A cross-section view of each of the thirty-eight types of rail that have been used by the lines which now compose the Southern Railway, ever since the days when trains ran on iron straps laid on wooden stringers, without coupling. It is interesting to note how early the T-shaped rail came into use (No. 7), how it was succeeded by the pear-shaped rail, and how some years later it came back, and has never been replaced.

15. Pear-Shaped Rail.—Unknown weight and history. Winston-Salem division.

16. Pear-Shaped Rail.—Weight about 60 pounds per yard. Made by Rhymey & Co., date unknown. Laid in main track of old Alabama Central and Selma, Rome and Dalton railroads, between Dalton, Georgia, and York, Alabama.

17. Pear-Shaped Rail.—Weight 56 pounds per yard. Laid about 1876 on Washington division.

18. "Booth" 54-lb. Steel-Capped T-Rail.—¼-inch crucible steel rolled onto a wrought iron head and stem. Used between Statesville and Taylorsville, North Carolina, about 1887, by the old Statesville and Western Railroad.

19. T-Rail.—Marked "54-lb., B. I. Co., 1880." Laid in 1880 in the old Alabama Central and Selma, Rome and Dalton railroads, between Dalton, Georgia, and Selma, Alabama.

20. T-Rail.—Weight 25 pounds per yard. Laid in 1885 on the Atlantic and Danville Railway between Claremont Wharf and Emporia, Virginia.

21. T-Rail.—Weight 30 pounds per yard. Same history as No. 20.

22. T-Rail.—Marked "40-lb., Am. Iron Co., 1878." Replaced Rail No. 4, between Macon and Brunswick, Georgia.

23. T-Rail.—Weight 35 pounds per yard. Same history as No. 20. Some 35-pound rail, marked "I. R. M. Co.," was used in 1881, probably on the Lawrenceville Branch Railroad.

24. T-Rail.—Marked "40-lb., A. C. O. Z. Co., 1880." Released from an industrial track on Charlotte division. Rail of this weight was used in the main track of the Asheville division from about 1870 to 1880 and in side tracks until 1903.

25. T-Rail.—Weight 45 pounds per yard. Rolled about 1870. Used in main track on Asheville division until 1880; in side tracks until 1903 and in circular track of the Asheville turn-table until 1913.

26. T-Rail.—Marked "50-lb., Penn. Steel Co., 1878." Laid by the Richmond and Danville Railroad between Selma, North Carolina, and Goldsboro, North Carolina.

27. T-Rail.—Marked "50-lb., Penn. Steel Co., 1878." Place of original installation is unknown. Used probably as relay rail between Toccoa and Elberton, Georgia.

28. T-Rail.—Marked "54-lb., C. P. Co. Ld., 1881." Laid in the main track of the Northern Alabama in 1884, and relaid in side tracks in 1887.

29. T-Rail.—Weight 56 pounds. Laid in the main track between Alexandria and Orange, Virginia, 1878, between Rome, Georgia, and Cleveland, Tennessee, by the Selma, Rome, and Dalton Railroad, and between Warrenville, and Hamburg, South Carolina, in 1877.

30. T-Rail.—Weight 52 pounds per yard. Laid in 1888 by the Atlantic and Danville Railway between Norfolk and Danville, Virginia, and still in service.

31. T-Rail.—Marked "54-lb., B. I. Co., 1882." Laid in the main track at M. P. 49 of the Northern Alabama Railway, in 1900, and released in 1910.

32. T-Rail.—56 pounds, Carnegie. Laid in 1888 by the Atlantic and Danville Railway in the main track between Norfolk and Danville, Virginia, and is still in use.

33. T-Rail.—Marked "60-lb., P. S. Co., 1899." Laid same year on Winston-Salem division and still in use.

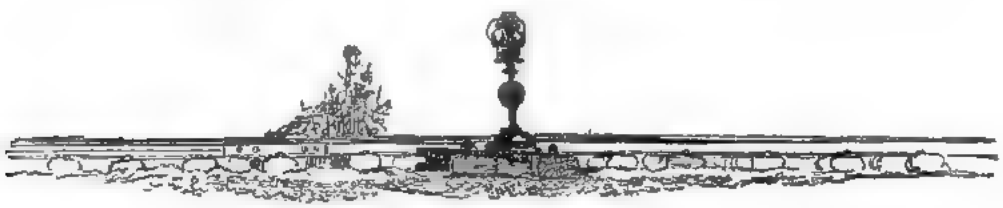
34. T-Rail.—Marked "67-lb., E. T., 1892." Laid between Huntingburg, Indiana, and Birdseye, Indiana, 1892, and since then released and now placed in side and passing tracks.

35. T-Rail.—Marked "70-lb., E. T., 1891." Laid by the Richmond and Danville Railroad Company in the track of the North Carolina Railroad, between Greensboro and Goldsboro, North Carolina.

36. T-Rail.—Marked "75-lb., A. S. C. E." First used about 1894 on the Macon and Brunswick Railroad, between Macon and Brunswick, and on the East Tennessee, Virginia and Georgia Railway, between Knoxville and Chattanooga.

37. T-Rail.—80-pound, A. S. C. E. First laid in 1894 of the Virginia Midland Railway, between Alexandria and Orange.

38. T-Rail.—85-pound, A. S. C. E. Carnegie Steel Company. Laid in the double track between Nokesville and Culpeper, Virginia, the latter part of 1903.



SAM LOYD'S RIDDLES FOR RAILROADERS

RAILROAD FINANCE.

THE present net income from the earnings of the P. D. and Q. road would be six per cent upon the entire stock issued, but as there is $4,000,000 in preferred stock, upon which there is paid seven and one-half per cent interest, the road is therefore able to pay only five per cent interest upon the common stock.

What is the total amount of this year's common stock dividends?

FROM INVERNESS TO GLASGOW.

IN going from Inverness to Glasgow, a distance of 189 miles, I was offered the choice of a narrow-gage railway or a lumbering old stage-coach. I selected the latter as being just half a day quicker.

From that circumstance I was enabled to jot down an interesting puzzle connected with my journey. The train and the diligence left simultaneously from opposite sides of the route, so by the aid of the mile-stones I was able to figure out that when we met the train from Glasgow we had beaten it just as many miles as we had been traveling hours. From this and the other facts mentioned you are asked to tell how far we were from Glasgow when we met the train. Get your pads and pencils!

LEAVE TWO AND CARRY ONE.

THIS simple little switching problem is interesting as illustrating that usually there is a shortest way of doing a thing, although there may be various methods of attaining the desired result.

The engine on D has been ordered to transpose cars numbered 1 and 3—switching the car 3 to A and car 1 to C—and then to proceed down the main track F drawing car 2, at present on B. There is room on B for one car, but it will not accommodate the engine.

With how few reversals of his engine, the first move counting as one, can the engineer carry out orders? No tricks or flying switches are to be employed.

In describing solution begin by stating the number of reversals required.

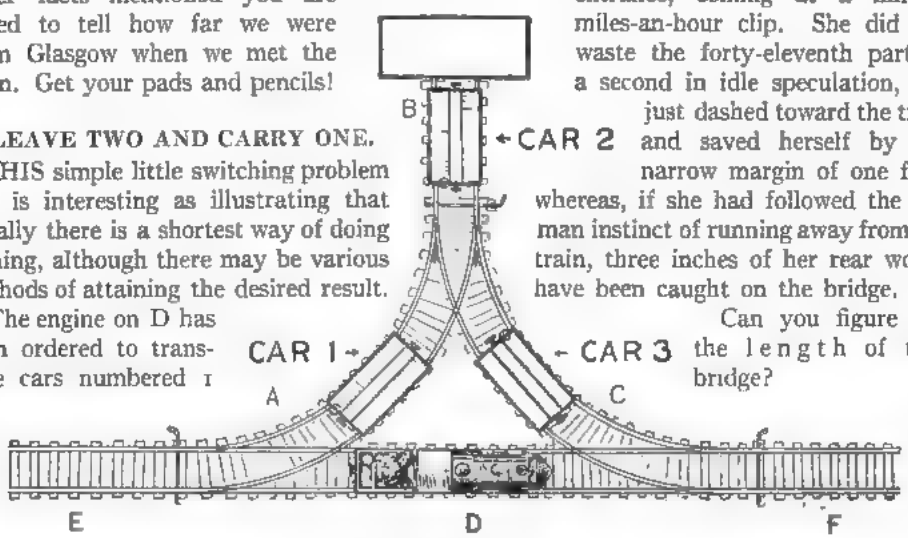
THE FLAGMAN'S PUZZLE.

THE mathematical flagman says that two trains—one 132 feet long and the other 88 feet long—met and passed in three seconds, but when going in the same direction it took the faster train fifteen seconds to pass the longer one; so he asks you to guess the speed of both trains on the basis of the above facts.

BEATING THE COW-CATCHER.

MY old brindle cow was standing five feet from the center of the bridge when she spied the lightning express, just twice the length of the bridge from the entrance, coming at a ninety-miles-an-hour clip. She did not waste the forty-eleventh part of a second in idle speculation, but just dashed toward the train and saved herself by the narrow margin of one foot, whereas, if she had followed the human instinct of running away from the train, three inches of her rear would have been caught on the bridge.

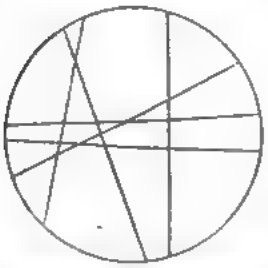
Can you figure out the length of that bridge?



LEAVE TWO AND CARRY ONE.

WHEN MUNCHAUSENS MEET.

"UP in the neck of the woods, where I hail from," boasted the commercial traveler, "six railroads cut across a section that might be contained within a circle of a quarter-mile diameter. Here is the sketch, and you will see that there are twelve crossing points."



WHEN MUNCHAUSENS MEET

"That's nothing," said the man who won't be outfibbed; "those same six roads meet back of my house, and your quarter-mile circle dropped over *my* district would enclose —— crossing points."

Now, the second Munchausen, by accident, announced the limit of possibilities, so we will ask our puzzlists to prove the truth of his statement by drawing a circle and crossing it with six straight lines to produce the maximum number of crossing points.

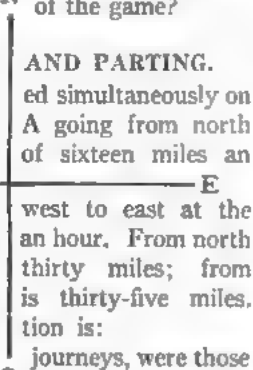
A GAME IN THE SMOKER.

THREE men who started to play pinocle in the smoking-car each possessed two United States coins. The six coins totaled three dollars. When the game ended each man still possessed two coins, but Smith had won eight cents and his brother John profited twenty-two cents. Now, how much did the other player have left at the end of the game?

APPROACHING AND PARTING.

TWO trains started simultaneously on their journeys; A going from north to south at the rate of sixteen miles an hour; B going from west to east at the rate of twelve miles an hour. From north to crossroads is thirty miles; from west to crossroads is thirty-five miles. The puzzling question is:

When, on their journeys, were those two trains closest together?



APPROACHING AND PARTING.

RACING IN THE JUNGLE.

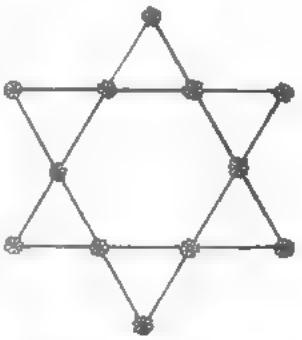
ON the Central-African Railroad, the animals of the jungle race along with the lumbering trains, and the passengers amuse themselves by timing the runners.

If a giraffe can beat a rhinoceros one-eighth of a mile in a two-mile race, and a rhinoceros can beat the hippo one-quarter of a mile in a two-mile race, what distance could the giraffe beat the hippo in the same race?

MR. TRIBUS'S BRAIN-TEASER.

LAST month we published, among the letters from correspondents at the back of the magazine, a brain-teaser which had been sent in to us by Mr. Joe Tribus, Call Box 227, Dillonvale, Ohio. This month we reprint the problem, together with a diagram which shows its solution in graphic form.

By the way, now is as good a time as any to break the news that you won't see any more brain-teasers in the back of the magazine as long as Mr. Loyd is on the job.



MR. TRIBUS'S BRAIN-TEASER.

He is our puzzle expert, and, accordingly, any one who has a riddle that he would like to see in the magazine should send it to Mr. Loyd, instead of to the editor. Address your puzzles as follows: Mr. SAM LOYD, care of the RAILROAD MAN'S MAGAZINE, 8 West Fortieth Street, New York City.

And now here is the brain-teaser as stated by Mr. Tribus, and on the right in this column is a diagram which shows the solution in graphic form:

A station-agent was given 12 rose-plants with which to brighten up the depot plat. In order to make a more effective showing, he placed the 12 plants in 6 rows of 4 flowers each.

OLD TIMES ON THE NORTHERN PACIFIC.

It's a Long, Sad Tale, Mates, This of the Feud Between S. S. Scobell, alias S. S. S., and J. E. M., alias J. J. Jones, J. J. Johns, and J. J. Jams.

J. J. J. TRAILED JOBS; S. S. S. TRAILED J. J. J.

To Our Hero, Clad in Seersucker Coat and Straw Hat, St. Paul in Midwinter Was Cold, but Not Nearly So Cold as the Heart of the Assistant Super of Telegraph—No Pseudonym Could Camouflage This Boomer from Scobell's Eagle Eye.

BY "J. E. M.,"

Author of "Old Times on the El Paso Southwestern," "Old Times on the Great Northern," "Old Times on the Galveston, Houston and San Antonio," "Old Times on the Gould Southwestern," etc.

THE Northern Pacific Railroad—the line which, perhaps, has had more vicissitudes than any other, at least in that section of the country—used to be a joke. It was a joke with the telegraphers of the time of which I am speaking.

Any opr, be he young or old, be he bald-headed or crowned with a thatch of hair, be he ever so much a boomer, or be he as steady as a rock—*any one* was welcome to the office of Mr. O. C. Green, who was for many years superintendent of telegraph on that justly celebrated line. I do not hesitate to say that outside of Mr. Walter D. Littlefield, of whom I have written in previous articles, Mr. Green was the most loved man in the telegraph service—railroad or commercial.

Enter S. S. S.

At that time Mr. Green had an assistant superintendent of telegraph—Mr. S. S. Scobell—whose heart was right, but whose temper was wrong. Mr. Scobell had been injured in a wreck on the Northern Pacific in 1886, and after recovering from his injuries he was assigned to the managership of the general office at St. Paul, afterward becoming assistant superintendent of telegraph.

In the fall of 1889 I landed in St. Paul, fresh from the South, with a straw hat and a seersucker coat, these articles of apparel being in season in Texarkana, from which place I had flown—I say flown because, although not a bird of passage in the accepted term, I was longing for fresh woods and pastures new.

Gee whiz, wasn't it cold! That straw hat and seersucker coat gave but little protection against the frozen blasts from the north which I encountered at the portals of St. Paul.

I had little or no money, so, as all operators in that period did, I hunted up the first telegraph office I could find, and asked the man on duty for a slight loan. The operator looked at me with a fishy eye—an eye as cold as the ice which surrounded

his office door—the first ice of the season, and told me to get hence. I got.

Cold! My goodness! Snow thrown in my face at the very portals of the saintly city! My seersucker coat waving in the wind and my straw hat caused much ribaldry and hilarity from the newsboys and street urchins, who yelled:

"Shoot t' Hat!"

"Lookat t' guy! He's blown in from t' South! Shoot t' hat! Pull down yer vest, mister; yeh don't beslong here—yes beslong in the South. Size up t' coat! Whiz! *Whiz!* WHIZ!"

I felt somewhat embarrassed at these facetious remarks—wouldn't you?

Some people have no sense of humor. Thank goodness, I have; so, although much embarrassed, I took it all in good part.

Well, I proceeded up Robert Street until I found a warm-looking restaurant, where I went in and ordered coffee and—and went to sleep. When they awakened me it was still cold—cold outside and colder inside, although the stove was red-hot.

The waiter was cold, the proprietor was cold, but I was the coldest of all. The poor old seersucker coat and the straw hat did not fit into the scheme of the great Northwest.

I gathered myself together, however, and went to see Mr. S. S. Scobell, the assistant superintendent of telegraph. Mr. Scobell greeted me with a chilly smile, but he needed operators.

I asked him what were the chances, and he told me that if I was a *good* operator he could use me.

Boomer Pard Clad in Prince Albert.

I had a pard with me; he was attired in a Prince Albert coat with flowing tails and a nondescript hat. This pard is now a prominent figure in the transportation world.

Mr. Scobell took a dislike to the attire of my pard, and told him right off the bat that there was nothing doing, and would be nothing doing for him on the N. P. Pard took umbrage at this, and told S. S. S. to go where there is a vast lack of water and very much heat.

Then Pard left the office, winking at me. I remained.

S. S. S. sized me up again, then placed before me the regulation application blanks; which I filled out in due order.

Then he sent me with a note to Mr. Whiney, manager of the telegraph office at headquarters in St. Paul. The note assigned me to Helena, Montana. Mr. Whiney, by the way, in conjunction with Mr. Walter P. Phillips, the general manager of the old United Press, afterward invented the famous Whiney-Phillips automatic repeater, than which, to my thinking, there are none better to-day—simple of operation, economical in maintenance, and accurate in operation.

Through the First-Line Trenches.

I passed the telegraphic test with flying colors, and was given a pass by Mr. Scobell to Helena, where I was to report to Mr. C. H. Gaunt, then manager of the relay office at that point, and who is now general manager of the Western Grand Division of the Western Union Telegraph Company, with headquarters in San Francisco, California.

Pard came to the depot to bid me farewell. Thirty cents was the bank-roll, and that was divided. I invested my fifteen cents in bologna sausage—about a foot and a half of it—and placed it in my coat-tail pocket for consumption on the way to Helena, a two days' trip. Pard promised to get to Helena at the earliest possible moment that he could make it without paying fare.

I was seated comfortably in the smoker about fifteen minutes before the train was due to leave, my feet perched upon the seat ahead, which an accommodating brakeman had turned for me, and was dreaming of the far West, feasts of bologna sausage *en route*, and the glories of a life on the Northern Pacific, when a messenger-boy from the general office came through the car, paging "J. E. M."

I told the boy that I was J. E. M., and he informed me that Mr. S. S. S. wanted to see me, and that it was very important. I argued with the boy that the train was due to leave in a few minutes and wouldn't

wait for anybody, but the boy insisted that Mr. Scobell had said that he would hold the train until I had had my conversation with him, and that I *must* see him.

I saw him.

Upon my hurried arrival at the general office, Mr. Scobell met me with a frown that resembled a June thunder-cloud.

Fired 2 Hours After Being Hired.

"Here, you!" he exclaimed as I entered his door, breathless from my hurried trip from the Union Depot. "What does this mean?" waving my application blank before my face. "You state here that your last place of employment was the cotton belt, and your clearance shows that you worked for the Wabash for ten days. You're fired! Get out of here; gimme that pass to Helena."

I tried to argue with him, but arguing was not his forte, so I was forced to surrender the pass.

Thus, in a sense, I was an employee of the great Northern Pacific Railroad for a couple of hours without emolument, though I was fired before going to work.

Such is life.

I was not discouraged, however. With the nerve and optimism of youth, I hunted up Pard, who was lurking in the neighborhood, and together we went to the freight-yard, where through the kindness of the telegrapher then on duty—a Mr. Hollaran, who was afterward, and for many years, superintendent of the Eastern Division—we secured transportation to Moorehead, Minnesota.

Mr. W. C. Vic Roy, until comparatively a short time ago a division superintendent, was then the chief despatcher at that point, and he was in dire need of operators. Pard and I struck him for a job.

He at first told us to go to St. Paul, and apply to either Mr. Green or Mr. Scobell. Of course, this program did not fit into our scheme of things. We told him that we had no desire to go farther east, and as he needed four or five telegraphers on his division right away, he wired Mr. Green for permission to employ one J. J. Jones, and one R. R. Robinson, telegraphers.

In a half-hour he received a reply from Mr. Green to employ Messrs. Jones and Robinson if they were competent. We were employed. I was Mr. Jones and Pard was Mr. Robinson.

I was sent to Manitoba Junction, about two hundred and twenty miles from St. Paul, while Pard was given a night job at Fargo, North Dakota. There he reigned supreme for some time, thanks to good fortune and good management.

I, however, was not so fortunate. I think I had held down the night job at Manitoba Junction for ten days or so when, one night, the Yellowstone Park Limited came to a stop before my station—and the first man to alight from it was Mr. S. S. Scobell, of blessed memory! He limped directly to the office with a bunch of telegrams in his hand.

I tried to dodge out of the door to avoid meeting him; but as I had orders to deliver to the conductor and engineer of the Limited, it availed me nothing. When I returned, there was Mr. Scobell standing at the little wicket. I had been newly shaven and otherwise slicked up, so I hoped that perhaps he would fail to recognize me.

Vain hope! The second he clapped his eagle eye upon me, he knew me.

"Where's the operator; where's Mr. Jones?" he inquired.

"Yours truly," I replied. "Right before your eyes you behold the great and only John James Jones."

Score One for S. S. S.

"You're fired!" Mr. S. S. S. exclaimed. "I'll take charge of the office to-night."

And he did.

Mr. Scobell worked that night, and, I believe, the following one, too—at least, I heard afterward that he did—and, glory be! he had one tempestuous time of it. The train-despatchers ragged him, and the operators along the line made life pleasant for him generally.

Along about nine o'clock, upon the arrival of a west-bound freight, I jumped the caboose. In due season I arrived in Fargo, where Pard was holding it down in "FD" office, and I got a stake and a send-off from him.

From Fargo, I entrained for the next division-point, Jamestown—or, in the vernacular, Jimtown — North Dakota, where there was a set of train-despatchers under Mr. Thomas R. Payne. Mr. Payne was afterward trainmaster on the Central Division, and was killed in a smash-up near Fargo in 1891.

Poor Mr. Payne! He was a good fellow, and was well liked by every one who knew him — trainmen, engineers, firemen, telegraphers, and trackmen. I believe the combined employees erected a monument to his memory, which stands to-day in a cemetery in Fargo, North Dakota.

Enter "J. J. James."

In Jimtown I told Mr. Payne that my name was J. J. James, and under that *alias* I secured a night OS job at Crystal Springs, about thirty miles west of the division point. Frank J. Harvey was our division superintendent, and a good one he was—liked by all; and though of a different temperament from Mr. Payne, the boys would do anything for him.

Mr. Harvey's specialty was humor and sarcasm. What Mr. Harvey couldn't tell a man without the use of a profane word—which was something of a feat in those days—would not be worth recording.

He could scorch a man down the front, turn him over on the side, and rip him up the back in a volley of words which contained not the slightest hint of profanity. In fact, Mr. Harvey was a purist; but his language burned like vitriol, and came from his tongue in such a stream that he was the admiration of the entire division.

I had been working at Crystal Springs for something like three nights when Mr. Harvey alighted from a west-bound freight-train and entered my office. I had heard of Mr. Harvey, but had never had the pleasure of meeting him personally.

He did not introduce himself, but, kicking open the office door, which stood half-way ajar, came into the telegraph office, which was also the ticket-office and general working-room.

I heard him give the door a kick, and was half-way across the room when he met me.

"What do you want?" I asked of the stranger.

"Want!" he yelled. "Want! I want you. *You!* See that baggage-truck out there? See it? Gaze upon it! I fell over it! Fell! Do you understand?

"Me! The superintendent of this division! Fell over a baggage-truck on the platform of the great and growing city of Crystal Springs, North Dakota.

"Who is going to pay me for my wounded feelings? And my skinned shins? Who, sir? Answer me; who?"

I stood there in the middle of the floor with my mouth wide open and answered never a word, while Mr. Harvey fixed me with his eye, and continued to demand who was going to recompense him for his wounded feelings and skinned shins. I declared to him that I had no idea, but if he wanted to know who wasn't going to recompense him, that person was John J. James, then acting night operator at Crystal Springs, North Dakota; and that if he advanced another step in the direction of the money drawer or the safe, the said John J. James would meet him more than half-way with a forty-five which the railroad furnished us—to say nothing of a death-dealing Winchester which we always kept loaded behind the safe and ready for emergencies. Believe me, I was scared.

"Maniac" Was the Super.

I did not know that the maniac before me was my superintendent, the joke-loving Mr. Frank Harvey, whom every one was supposed to know, and who really knew practically everybody on the division from the water-boys to the conductors. No; I thought that I was dealing with some freak fresh from the insane asylum.

He soon convinced me, though, that he really was Mr. Harvey, and we had a good hearty laugh over the episode.

Mr. Harvey crossed the great divide in 1895, while employed as superintendent of construction of a new railroad in the Northwest — the Canadian Northern — when a blast of dynamite held fire, and Mr. Harvey went to relight the fuse.

I thought that I was permanently located at Crystal Springs, and was reason-

ably happy there. But my Nemesis in the person of Mr. Scobell followed me. In about three weeks he spotted me from a car-window as a train was at our station, and the next day John Jones James was relieved. A time-check accompanied the man who relieved him.

I had a friend, of whom I have spoken in previous articles, who came from the Texas and Pacific and the Cotton Belt, and with whom I worked for a long time at Marshall, Texas, and Texarkana, Texas. This man is Mr. Ira B. Richards, now general superintendent of the Northern Pacific at Tacoma, and for a long time general manager of the lines west of Paradise, Montana.

Richards Was a Friend in Need.

Mr. Richards was, at the time of which I write, division superintendent of the road at Glendive, Montana, the next grand division point.

So, acting on the theory of "safety first," I hied me to Glendive and hunted up my old friend, "Dick" Richards, to whom I unbosomed myself.

"Never mind, J. E. M.," said Dick; "I'll give you a job right here in Glendive yards. Make out this application; and, mind, make it out in your own name—no 'flag' goes with me—and I'll protect you."

I did so, and went to work in the despatcher's office at Glendive, at a salary of eighty dollars per month, which was considered very handsome in those days.

Mr. C. B. Dickson was the chief despatcher, while T. R. Troutt was the trainmaster. Mr. Dickson was afterward superintendent of the same division. Mr. Troutt went to the White Pass and Yukon Railroad when Mr. C. B. Rodgers, of the Great Northern, or the St. Paul, Minneapolis and Manitoba, was opened, and Mr. Rodgers was appointed general manager, as I have mentioned in a previous article.

I was not allowed to remain in Glendive very long, however, for, through some underground channel, the powers that were, in the telegraph department at St. Paul, became aware of my presence, and ordered Mr. Richards to relieve me, which he did with much reluctance.

My next move was to Billings, Montana, some hundred and fifty miles west of Glendive. This is the point where the Chicago, Burlington and Quincy—or, in those days, the Burlington and Missouri River—made connection with the Northern Pacific, and transferred its freight and passengers destined for the coast, or points west, to the latter road.

Billings was, and is, some live town. Made up of a heterogeneous mass of cowpunchers, ranchmen, prospectors, and devil-may-care railroad men, there was something doing every second in every hour of the twenty-four, and seven days a week.

There was no despatcher's office at Billings, though, and I contented myself with sitting in for an operator at the Western Union who copied a "pony" report for the morning paper there.

One day I called up the chief despatcher, Mr. H. W. Wells, whose headquarters were at Livingston, Montana, and asked him what the chances were for a job. He told me that he could use me if my references were all right. I told him I had no references with me; that I had been out of the service for some time, but that if he could place me I would obtain the required references.

He needed operators, as indeed did every railroad and every division of every railroad, to say nothing of the commercial companies, in the country. So he gave me a wire pass to Livingston, with instructions to report to him the following morning. My name at that time was James Jones Johns.

Another Shuffle in Names.

Mr. James Jones Johns arrived in Livingston, Montana, early the following morning, full of hope and Montana air—mostly air—and had an interview with Mr. Wells. After the regular routine he gave me a pass to Bozeman, only about twenty-five miles west of Livingston, and a good live, wide-awake little city.

Here I was assigned to night service at seventy dollars per month. All I had to do was to copy train-orders and messages, hustle a few thousand pounds of baggage

from the two passenger-trains, one east-bound and the other west-bound; help unload four or five cars of local freight which had been set in on the house track late in the afternoon; sell tickets for the two passenger-trains; clean and fill twenty-five or thirty switch-lights in addition to my train-order board-light and the office lights; sweep out the telegraph office and the two waiting-rooms, and perform a few other minor duties.

When these chores had been done the balance of the time was my own, to do with as I wished. I usually wished to sleep; but the train-despatcher on duty did not agree with my wishes, and objected strenuously to calling BZ for an hour at a stretch.

One fine day I found another boomer telegrapher standing gazing into the office window, and speculating to himself whether he would enter or not.

Lo, the Poor Boomer.

I knew he was an operator. I could smell him. Strange, isn't it, that an educated nose can smell a boomer telegrapher a half-mile away. In those days of free-booting it was easy. But the day of the boomer has passed—the bell has rung for him, and he has been relegated to the scrap-heap, together with the obsolete types of engines which were once the pride and glory of the railroads which owned them.

This boomer, though, appeared to be a little better than the general average. While his clothes plainly showed the signs of wear, they also showed that he had given them more than ordinary attention, and one could by observation see that his hands had undergone a soap-and-water treatment.

I would like to tell you who this boomer was, or is, but I fear he would not like it. Suffice to say, though, that he now occupies a very responsible position in the executive department of the Northern Pacific, and is liked by every employee of the road, from track-walker to president. At any rate, after studying the interior of the office for a time, he turned as if to go away, when I accosted him.

"Whither away?" I asked him.

"Hence—up-town—to the big noise," he replied

"Why the haste?" asked I. "Let's sit down on yon baggage-truck and chew the rag."

"Right-o," replied he.

So we adjourned to the shady side of the depot, where the "makings" were produced, and we had a comfortable chat.

It developed that this particular Mr. Boomer had been sent from St. Paul to relieve me, but after sizing up the situation he had decided that he did not care for the job. As yet he had failed to present his letter to the agent, and he felt very much inclined to pass the job up.

I Give Myself the Gate.

The job was no sinecure, believe me, and I was really glad to know that some one had come to relieve me. So I talked the man into going down and reporting to the agent, Mr. Otto Schill, who is now, I believe, a traveling passenger-agent for the road, with headquarters in the far West.

I had to stay in Bozeman three or four days awaiting my time-check, which was issued from the office of the superintendent of telegraph in St. Paul. When the time-check came, made out in the name of James Jones Johns, it was accompanied by a service card which stated that my services were no longer required, and that I had been dismissed the service because I had too many names, and because, while I was a good telegrapher, my record with the Northern Pacific was bad. I didn't argue the question; I simply took my money, tore up the service card, and took the next train for Helena, which was the next division point.

Here was located Mr. Gaunt, of whom I have spoke above. Mr. Gaunt was the manager of the relay office, wherein were employed about eighteen or twenty men. At that time Helena, too, was a relay point for the Western Union Telegraph, with Mr. McMichael in charge as manager. Mr. McMichael later went to Minneapolis as division superintendent for that company, and is now a general superintendent of the Canadian Pacific Railway's tele-

graph. . He employed in his office something like thirty or thirty-five men, all of them the cream of the profession, for the overland wires required that class of service — men who were absolutely accurate, who could send and receive with equal proficiency; such men, in fact, as "Jack" Hayes, his brother "Jeff," Charles Seaton, "Larry" Pearson, Henry Davis, "Lew" James, "Billy" Delancy, and many others of more or less fame.

I did not bother with the Western Union at this time, however, but hied me gleefully to the Northern Pacific telegraph office, where I asked Mr. Gaunt if he did not need an operator.

He did. What was my name?

Introducing James Jones Jacks.

It was James J. Jacks this time. Get it? James Jones Jacks, and under that cognomen I went to work. By this time I was out of the jurisdiction of Mr. Scobell, and under the immediate supervision of Mr. E. E. Dildine, whose title was, and is to-day, assistant superintendent of telegraph of lines west of Helena, and whose headquarters are located in Tacoma, Washington. Mr. Dildine has been in the service of the Northern Pacific for many years, and is idolized by the men under him.

In the relay office at Helena we had some of the greatest stars of railroad-telegraph talent to be found anywhere. Here at that time was employed William Flint, whose father—as I have told in an article entitled "Old Times on the West Shore" — was the first superintendent of the old New York and New Jersey Midland Railroad, and who lost his life by the collapse of a bridge on that road, between Middletown and Norwich, New York. Another employee was William T. Thornton, who afterward was a trainmaster on one of the western divisions of the Northern Pacific. I also remember Charles R. Welden, a well-known press telegrapher; "Kid" Weeden, well known in Western newspaper circles, and others.

Under the name of Mr. Jacks I gained considerable fame myself in the Helena office, until one fine day Mr. Gaunt received instructions to dispense with my valuable services. Some one had recognized me, and had turned me in.

There was a conductor, "Billy" Martin, whose run was from Helena to Missoula. Billy and myself were great personal friends. His heart was as large as his body, which measured six feet two, and goodness knows how much in breadth.

A Lift from Billy Martin.

Billy carried me, or, as he used to remark to me in his inimitable Southern drawl, "toted" me, from Helena to Missoula. Here John D. Fellows was the division superintendent, Fred K. Knowles trainmaster, and Charles D. Rawlings the chief despatcher.

After putting up at the railroad beanery and hotel for the night, I approached Mr. Rawlings in reference to a job.

"Yes, I need operators," said Mr. Rawlings. "Where have you ever worked?"

"Worked?" said I. "Worked? It appears to me that I have heard that word before, but I cannot just place it. But if if you mean where I was last employed, I can answer that question with speed and merit; my last position was with a gink named Morse.

"I think his full name was R. E. Morse; I am not sure. I have a big head and a wonderful ambition."

"You talk good," said Mr. Rawlings smilingly. "What is your name, and where did you come from?"

"My name," I replied, "matters not. For the present it is John James Jams, and I sine 'JJ.'"

"All right, Mr. J. J. Jams," said Mr. Rawlings. "Go to it. Hit the ball at Flathead nights. Take this application blank with you and fill it out there—also this application for bond. You will act as agent at that justly celebrated point for two weeks during the absence of the regular agent. The train leaves in two minutes —beat it!"

I beat it. Can you beat that?

I arrived at the city of Flathead late in the afternoon. It was not, and it is not, a large city, but it was *some* town, believe me!

It appeared to me that the entire populace had gathered at the depot to welcome the new agent. There was a brass band there; and as I stepped from the car-steps, the brass band broke out into the stirring strains of "See the Conquering Hero Comes."

I was somewhat dazed. I couldn't understand the enthusiasm, for I was a stranger to them.

But, buttoning my coat around me and assuming my most dignified pose, I prepared myself for a speech, when down the platform from the last Pullman came a man with flowing whiskers, Prince Albert coat, and an air of assurance.

Got in the Wrong Blaze of Glory.

I never delivered my speech. It died in its borning. This man was one of the United States Senators from the State of Montana—a multimillionaire, who was afterward my friend. He delivered the speech, while I eloquently said nothing.

I took charge of the railroad station, and remained there until the regular agent returned — in two weeks. Then Mr. J. J. Jams removed himself from the scenery and struck the next division point, which was Spokane at that time.

Here my name was John Jacob Johnson, and as such I worked in Spokane and at various stations on the road, "OSing" and otherwise assisting in the general disarrangement of trains, until Mr. Dildine discovered me and brought me to Tacoma, where he still has his headquarters.

Upon my arrival at Tacoma, Mr. Dildine greeted me with a pleasant smile, and asked me if I wanted a job.

Somehow I didn't take a great liking to the Northern Pacific, so after thanking Mr. Dildine for his kind interest in me, I asked him to give me a pass to St. Paul.

He looked at me for a minute, then laughed and said:

"I'll give you the pass, all right, but I'll be dinged if I know in what name to make it out—J. E. M., John James Jones, John J. James, James J. Johns, John J. Jams, or the latest invention of your ever-inventive mind, John Jacob Johnson. How shall I make it out?"

I told him it didn't matter materially what name the pass was made out under so long as it carried me east—the golden West was too much for me. He made out the pass, and I got away from that section of the country.

I really didn't recognize myself when I started east. I didn't know by what name I had worked on the different divisions without consulting my memorandum-book.

My old friend Billy Martin, wearing the brass buttons, hauled me from Missoula to Helena, and after punching my pass, said encouragingly:

"Jack, old-timer, why don't you settle down and come to work here? The boys all like you, and you can make good. Come on! Be a good fellow, and come to the Missoula Division."

I thought it over, but my feet itched; so after thanking him at the end of his run at Helena, I shook his hand heartily and bade him good-by.

Killed in Sight of Wife and Child.

Poor Billy Martin! Two days later he was caught between two cars in the yard at Helena and crushed to death, while his wife and young daughter, standing on the passenger platform, witnessed the accident.

He had stepped between the cars to rescue a stray dog that had been injured by a switch-engine, and while stooping to get the animal, an engine backed up against the cars with great force, throwing Mr. Martin against the end of the ore-car. The impact was so great that the draw-heads were smashed, and poor Billy was mangled almost beyond recognition.

Such, though, was the life of a railroad man. There have been many more Billy Martins, and probably will be as long as there are railroads.

Upon my arrival at St. Paul I secured employment with the St. Paul, Minneapolis and Manitoba Railroad, now known as the Great Northern system.

In winding up this story, I wish to say that Mr. S. S. Scobell died in St. Paul on New Year's Day, 1891. He was a good fellow, but took an instinctive dislike to me—which dislike was duly and fully reciprocated.

H. G. KELLEY NEW GRAND TRUNK HEAD.

IT was said of the late Charles M. Hays that he was the one man in America who could choose his own job. He chose the presidency of the Grand Trunk Railway as offering the greatest opportunities for constructive work.

The jurisdiction of the Grand Trunk's president extends over lines which stretch from the Atlantic to the Pacific in Canada, dip down through five States in the middle West, and traverse practically the whole of New England.

To act as "sovereign" over this vast realm, Howard G. Kelley has been elected, leaving the post of vice-president in charge of Operation, Maintenance and Construction, and succeeding E. J. Chamberlain.

President Kelley began his railway career in 1881 on the Northern Pacific, where he was engaged as assistant engineer. He was attracted to the mining-field in 1884, but came back to railroading three years later to accept the position of resident engineer on the St. Louis Southwestern system.

His ability marked him for speedy promotion. In the next thirteen years he became chief engineer of the St. Louis Southwestern, the Minneapolis and St. Louis, and the Iowa Central lines.

In 1907 he came to the Grand Trunk as chief engineer, and four years later was made vice-president. The next year he was elected president of the American Railway, Engineering, and Maintenance of Way Association.

Mr. Kelley is a British subject and a great lover of work, which he believes is the best recipe for success.

In addition to splendid scientific and practical training, Mr. Kelley has the qualities of mind which make for the successful handling of big tasks. He is a man who inspires the loyalty and affection which lead to efficiency and accomplishment. His courtesy is not a veneer, but part of the man himself, and it is extended not only to the influential caller, but to all comers.

HOWARD G. KELLEY, THE GRAND TRUNK'S NEW PRESIDENT IS ANOTHER LIVING PROOF OF THE FACT THAT MOST RAILWAY CHIEFS RISE FROM THE RANKS ON SHEER MERIT.

YOUNG ORDEN PUTS 'EM IN TO CLEAR.

BY WILLIAM WALLACE COOK,

Author of "The Road to Antioch," "Running the Signal," "The Paymaster's Special," etc.

When Judge Bryde and His Gang Trimmed This "Wise Guy" They Started Something That Was Sure Ominous.

A FIVE-PART STORY—PART FOUR.

SYNOPSIS OF PREVIOUS CHAPTERS.

YOUNG Guy Orden's hermit Uncle Sim turns him loose with a riding-horse and one thousand five hundred dollars, telling him to report in a year to his other uncle, George, a rich business man, of Los Angeles. In Arizona Guy hears the story of Pete, the Bonanza Burro, an animal once owned by a prospector named Riordan, who was killed shortly after he had discovered a wonderful pocket of gold, the location of which Riordan had kept hidden This burro, it is thought, might be induced to lead the way to Riordan's secret strike. Guy trades everything he has to a gang of swindlers for a burro doctored up to resemble Pete The gang consists of Judge Bryde, Colonel Copperthorne, and one Grimsby.

Guy resumes acquaintance with beautiful Mollie Harper and her trifling brother, Lee, and saves them from being robbed by Grimsby, who now operates under the name of Grimshaw. He also procures Grimshaw's arrest for borrowing one thousand dollars from Leavitt, the superintendent of the Montezuma Mine, using a fake pearl necklace as security.

Mollie rejects Guy's proposal of marriage on the ground that she is engaged to Rolfe Barstow, a mining engineer. At the same time Guy learns that his Uncle George predicts his utter failure. These rebuffs make him only more determined to succeed.

Guy finally buys the real Bonanza Burro. The animal leads him to Riordan's strike, which he finds stripped of every particle of its gold.

CHAPTER XV.

SURPRISES.

SO some one had got to the gold-pocket first, and cleaned it out!

The ways of Nature, in scattering her yellow wealth, are weird and wonderful. Hills are ribbed with gold, rivers carry gold and deposit it far from its source, and gold is cached in choice lots, where it may be pried from rock-crevices or dug out of granite crannies.

As for gold "pockets," they are that and nothing more. When picked of their wealth, there is an end. Another loaded pocket might not be found within a score of miles.

Orden had allowed himself to become unduly exercised over his successful work with the burro. After he had panned and panned from the bottom, sides and the vicinity of the pocket, he was thoroughly satisfied that no gold was left.

Either Riordan had taken the last ounce of dust from the pocket, or else some late comer had found the place and worked it out. Perhaps Gonzales, or the Mexican who had owned Riordan's Pete before him, was the lucky man. So far as Orden was concerned, it made little difference where the gold had gone. The important fact was that it was missing.

"Anyhow," he said to himself with a glum laugh, "I have found the Bonanza Burro and have been led to the scene of Riordan's strike. Now I can report, and the treasure-hunters of the Southwest can turn their attention to the Peg-Leg Mine, or the Frenchman's Mine, or the mines of the old Spanish *conquistadores*. I have put one fable out of business, and that ought to be considered a creditable piece of work."

Orden did not return to Buenas Noches. His pride balked at paying a second visit to the place and running the gantlet of jeering citizens who were undoubtedly waiting for him and expecting him. Instead of calling

at Buenas Noches, he traveled a day and a half, spent another night in the hills, and came finally to the town Ruby.

Ruby was in the vicinity of Cave Creek, where onyx was quarried. There were a dozen shanties at Ruby, and the largest shanty was a hotel.

Orden did not talk to Pete on the way out of the hills. He towed the burro at the end of the picket rope, and was tempted more than once to cast him loose to shift for himself. That he had clung to the obstinate burro, and borne with him, was a cause for congratulation afterward.

Orden reached the Ruby House in the afternoon, removed the pack from the burro and the riding-gear from the horse and turned both animals into the hotel corral.

At one side of the hotel was a shed with stalls. One stall was occupied. Orden went into the shed for some baled hay, then dropped the forkful of hay when he caught a fair glimpse of the horse in the stall. He went nearer to the horse, but not until he had gone into the stall was he absolutely sure.

"Fanita, old girl," he murmured, his voice husky, "this is a big surprise! How is it that I happen to find you here?"

Fanita was the horse turned over to Grimsby with the fifteen hundred dollars, a short march out of Halemby's. Fanita it was that had borne Orden from Castle Creek Cañon when he had left his hermit Uncle Sim and started out to look at the world.

Fanita! The horse he had raised from a colt, and loved as he loved old Tige, and the tame pigeons at Uncle Sim's!

Fanita recognized him, and whimpered and rubbed a cold muzzle against his shoulder. Orden returned for the forkful of hay and scattered it against the corral fence so Pete and the other animal might browse at their leisure; then he left the corral and reported to the landlord on the front porch of the hotel.

"That's a fine horse in the stall off the corral," said he.

"I don't reckon a hundred and a half would touch that mare," the landlord answered.

"Where are the trappings?"

"Hangin' in the front room."

Orden passed through the door. Hanging by a stirrup from a peg in the wall of the front room was the saddle, the Navajo saddle-blanket caught on the pommel. From another peg swung the bridle with its familiar silver rosettes. He recognized the gear. Once it had belonged to him.

"Who owns the mare?" he asked, returning to the landlord.

"Colonel Copperthorne," was the answer.

Orden's gray eyes gleamed. Sometimes luck is born of ill-luck. Had he not been disappointed in the matter of Riordan's pocket, he would have been in Buenas Noches that afternoon and, of course, have missed Colonel Copperthorne.

"Where is Colonel Copperthorne?" he went on.

"Away, some'res on business. He was around a spell ago. You going to stop with us a while?"

"I don't know how long. Can you give me a room?"

"Only got three sleepin'-rooms. The man from Los Angeles has one, Copperthorne has the other, and I guess if you take the one that's left this shebang will be full up."

"I left my horse and burro in the corral—"

"Found the hay and water all right, did you?"

"Yes. Now if you'll show me to the room, I'll be obliged. I'm just in from a hard ride. How far is it from here to Buenas Noches?"

"Forty mile."

"That's where Riordan used to hang out, isn't it?"

The landlord cast a shrewd glance at Orden.

"Well, yes," he answered. "You one of the crowd that's interested in Riordan's pocket?"

"I don't want to talk too much about that," Orden answered. "Somebody might get a line on my business, you know."

The landlord chuckled as he led the way to the second floor and threw open the door of a rear room.

"That's the best I can do for you, friend," he observed. "We don't keep a regular register, but I take the name of every one that comes. What might your name be?"

"Guy Orden."

The landlord removed a pencil and a ragged note-book from his pocket and jotted down the name

"Rates are two dollars a day, and the burro and the hoss will be four bits apiece. Supper at six, Mr Orden. Water and towels in your room?" He craned his neck through the door to look.

"Uhuh," he went on, drawing back. "The room ain't as good as some, but I guess you'll be comfortable."

Orden was not thinking much of his personal comfort, just then. All his reflections were lost in the big idea that Copperthorne

was in Ruby, that Riordan's burro was in the corral, and that these facts occupied opposite corners with a grand chance lying between them. Fate was indeed kind to him.

Orden poured out a basin of cool water and plunged his face and head into it. He dried his face on the coarse towel and rubbed his head briskly. How was he to help matters along in the case of Colonel Copperthorne?

Throwing himself down on the bed he stared upward at the cloth-covered ceiling. Riordan's Pete had become a joke in the Southwest.

Was Colonel Copperthorne still taking the Bonanza Burro seriously?

Had the judge's observation that he and the colonel were hunting the Bonanza Burro been nothing more than a fabrication to help Grimsby get rid of the counterfeit animal?

Events would have to unfold before Orden could know about this. Already he had started events in the right direction by hinting to the landlord that Buenas Noches was in his thoughts, and by giving his name.

Perhaps an hour passed, and Orden was aroused from his reflections by voices below the window of his room. He arose and looked out.

The room, as a third-best room, was at the rear of the house and overlooked the back yard and the corral. Three men were hanging over the corral fence. One was the landlord, another was a stoutish young man with a canvas haversack over his shoulder and a short-handled hammer in his hand, and the third—was Colonel Copperthorne. They were talking, and at no great distance from the house. Quietly, Orden raised the window.

"That's the Bonanza Burro," averred Copperthorne, staring over the fence, "and I'll swear to it!"

"You don't take any stock in that Riordan yarn, do you?" asked the man with the hammer.

"There are fools who don't," was the answer, "and I'm not one of 'em."

"Most of the people who believed in the pocket have reformed," the other chuckled, "since Bonanza Burros got so thick. Shouldn't wonder, colonel, if you helped to reform a few of the rainbow-chasers."

"I don't know what you mean," said Copperthorne sharply. "When did that burro come in, Yarnell?"

"An hour or more ago," the landlord returned.

"Who brought the animal here?"

"Young feller who asked about Buenas Noches, how far it was from Ruby, and if that wasn't the place where Riordan used to hang out."

"That means he's on the trail of the pocket!" exclaimed Copperthorne.

"Sure it does," said Yarnell. "I taxed him with it, right out, but he wouldn't let on."

Copperthorne passed through the corral gate and Orden watched while he put his hands on the burro, paid particular attention to the neck where the strap of the cowbell, months past, had worn the hair, then examined the lame foot and the streak of white down the back.

"No doubt in the world," declared Copperthorne, coming back to the two by the fence. "Handled right—handled as I know how to handle the brute—right there is a fortune on four hoofs. I wonder if this man you speak of, Yarnell, knows what he's got?"

"Seems to, seeing as how he mentioned Riordan and Buenas Noches."

"What's the man's name?"

"Orden, Guy Orden."

Copperthorne fell back a step.

"That fellow!" he muttered. "Are you sure, Yarnell?"

"I got it down in my book."

"Here's a chance for me!" exclaimed the colonel. "You, old man," and he laid a hand on the arm of the person with the hammer, "can do me a favor."

"How?" the other queried.

"Step this way a minute and I'll tell you."

The two drew away from Yarnell and went into a whispered consultation. Orden, highly elated, softly closed the window and again stretched out on the bed. In a few minutes he heard steps on the stair, along the upper hall and then a rap on his door.

He answered the summons, expecting to see Copperthorne. Instead, he was confronted by the man who had carried the hammer and the canvas haversack.

"Mr. Orden?" the man inquired pleasantly.

"My name," said Orden.

"If you can spare me a few moments I'd like to talk business with you. My card."

He offered an oblong square of pastboard, on which Orden read:

MR. ROLFE BARSTOW,
Mining Engineer.
Los Angeles California.

Orden stared, and was a half minute collecting himself and inviting Barstow into the room.

CHAPTER XVI.

DEVIOUS MANEUVERS.

RUBY, a town completely ignored by the larger maps, was taking a very important place in the topography of Orden's affairs. Chance was staging a series of red-letter events in Ruby, and they were not the less effective because played up so unexpectedly. Now here was Rolfe Barstow, the gentleman who had advised Molly Harper's purchase of the Blake placerings and who was one day to marry the girl who had turned down Orden.

He looked like a thoroughly competent person. Closer inspection proved that he was not so young as he seemed when viewed at a distance.

Orden guessed his age at thirty-five. His face, not uncomely, was thin-lipped. The lower jaw was heavy and the chin was weak. The eyes were brown and none too steady.

It was evident that Barstow had heard nothing about Orden through Mollie. Orden, so far from feeling any resentment toward his successful rival, was minded to be friendly.

In order to win so rare a girl as Mollie, it was logical to presume that this mining engineer was a good deal of a man. He was too much of a man, Orden fully believed, to aid the unscrupulous Copperthorne in a shady transaction.

"Glad to know you," said Orden heartily, and gave Barstow's hand a warm clasp. "Sit down," he went on, indicating the only chair in the room; "I'll roost on the edge of the bed."

"I have just returned from a day's work in the hills," observed Barstow with an engaging smile, "and happened to see that crop-eared burro in the corral. Yarnell tells me the animal belongs to you, Mr. Orden, and that you are planning a hunt for the Riordan pocket."

"I didn't say anything about that to Yarnell," returned Orden.

"He put two and two together and made up his mind that you were after the pocket."

"Naturally," commented Orden, "you cannot hold me responsible for the landlord's imagination."

"I have no business prying into your affairs, and I have only called on you in the hope of doing you a good turn. A long experience in the mining country has taught me a good many things, Mr. Orden. Wild stories of lost bonanzas circulate pretty freely, for nine-tenths of the miners are ignorant and gullible. That is one thing experience—rather dear experience—has impressed upon me.

"The stories about Riordan and his pocket are the limit in that class of fiction. Believe me, there is nothing in the yarn. I hope you are cherishing no illusions."

"There was such a man as Riordan."

"Granted."

"And he came into the settlements mysteriously with pounds and pounds of nuggets."

"I would hardly say 'pounds and pounds.' More likely he brought in a few ounces."

"Riordan had a burro called Pete, a burro peculiarly marked."

"Exactly," and a smile played about the thin lips once more.

"This burro came and went between the settlements and the pocket with his owner, Riordan."

"We will agree on that."

"If properly handled, Mr. Barstow, the right burro ought to guide a man to the place where Riordan made his strike."

"That is the accepted version."

"Well, what's wrong with it?"

"It's all moonshine. Grafters have seized upon the story of Riordan's pocket and used it in duping foolish treasure-hunters. Many lame burros have been ear-cropped and made over into duplicates of Riordan's Pete. The schemers are the only ones to make money out of that pocket."

"I know that. A rascal called Grimsby sold me a counterfeit burro more than a month ago. Since then I have felt deeply interested in the pocket mystery.

"The burro out in the corral is genuine. I ran across him on the San Benito. He was owned by a Mexican who had tried to use him as a guide to the pocket. The Mexican was disgusted, and let me have Riordan's Pete for five dollars."

"A poor investment, even at that price! The Mexican told you the burro would not lead the way to Riordan's supposed strike. That alone should have kept you from buying the brute."

"No. The Mexican did not manage the burro in the right way. Riordan was buried in Buenas Noches, and the proprietor of the hotel there had the prospector's pack-saddle, the bell he used on Pete, and the prod for urging Pete along."

Barstow appeared greatly amused. He continued to smile and nod.

"We've all heard of the Riordan relics,"

said he, "and how Bankson used to charge two bits for a look at them."

"Well, I bought the relics."

"Why?"

"For use in getting at the pocket, Mr. Barstow. The idea is to surround the burro with as many of the old conditions as possible. Put the old pack-saddle on him, buckle the bell around his neck and urge him with Riordan's prod, and I maintain that, if properly started, he will lead the way to the spot where Riordan secured his gold."

Barstow was struck with this theory, to judge from his manner.

"That's a deucedly clever idea!" he exclaimed. "If there was anything in the pocket story it might win. I came here to persuade you that you have embarked upon a wild-goose chase.

"The fact is, Orden, I need a burro to tote my ore samples, and there's not one to be had in town. I was hoping you might sell the burro in the corral.".

Orden was disagreeably surprised. Barstow was not the man he thought. The mining engineer was playing directly into the hands of Copperthorne, and trying to buy Riordan's Pete for him. What would Mollie have said to that?

"You are examining mining properties around here?" queried Orden.

"I am an expert at that sort of thing, Orden. Just now I am looking over the King Midas for George Orden, of Los Angeles. He—"

It appeared to strike Barstow, all at once, that the name of the man he was talking to, and the name of his present employer, were the same.

"By the way," he went on curiously, "do you know George Orden?"

"He is my uncle, but I don't know him."

"Well, well!" enthused Barstow. "This is odd, and no mistake! It makes me all the more anxious to prevent you from making a bad venture. I am so greatly in need of a pack animal, Orden, that I will cheerfully give you fifty dollars for that homely brute in the corral"

"He's not for sale," said Orden firmly.

"Even a hundred dollars wouldn't touch him?"

"No."

"If that's the way you feel about it, I'll not bother you any further."

Barstow got up.

"You'll be here for some time?" he asked.

"For a day or two."

"Then we'll have a chance to get better acquainted with each other, I hope. It is a very great pleasure to meet the nephew of George Orden, of Los Angeles."

With that Barstow went his way.

"From what I overheard him say to Copperthorne, by the corral," mused Orden, "Barstow knows Copperthorne is a crook. Yet he is helping the sharper! That means—" and he turned hot and cold at the thought—"that Barstow himself is no better than he should be! How could Mollie Harper have been so deceived?"

This conclusion, forced upon Orden by the logic of circumstances, worried him considerably. He would always love Mollie Harper, and he was unselfish enough to consider her welfare and happiness, even though she was not for him. If she married a man who condescended to aid Copperthorne, what 'sort of a future would she have?

Furthermore, a man false to one would be false to another. As a mining expert, how was Barstow looking after the interests of Uncle George? The whole affair had an ugly look.

At six o'clock Orden went down to supper. There were but three at table—Copperthorne, Barstow, and Orden.

"Mr. Orden," said Barstow, "my friend, Colonel Copperthorne!"

For just a second there was a flicker of anxiety and apprehension in the black eyes of the colonel. These troubled feelings were swept away, however, by the hearty greeting of Orden.

"Why, colonel!" he cried, shaking hands. "There's no need for you and me to be introduced. What brings you this way? Where's the judge?"

"Hanged if this isn't a surprise!" returned the colonel genially. "The world ain't so big, is it? And the Southwest is mighty cramped for space! The judge? Oh, he was in Los Angeles at last accounts. How are you anyhow?"

"First rate."

"How do you like the world by now, Orden? Rough places smoothing out?"

"Well, a little," and Orden laughed. "I see you have my riding-horse—the one I turned over to Grimsby."

"Funniest thing ever about that horse!" exclaimed the colonel. "The judge and I overhauled Grimsby, and the scalawag congratulated us on failing to get his bogus burro. He was on our trail with the brute when you happened along.

"I told him to his face, by sixty, that he

was a scoundrel. But what good did it do? None. Grimsby is a hardened reprobate, and he ended by selling me your horse at a bargain. That's how I happen to have the animal.

"There's another burro, a good deal like the original Riordan's Pete, in the corral," added Copperthorne, with a side glance at Orden out of the corners of his eyes.

"Belongs to me," said Orden. "He is the real Bonanza Burro."

"He don't look like a counterfeit, and that's a fact. Barstow has been hunting for a burro, and he didn't know but you might sell him that homely brute. Barstow needs a pack animal."

"Have you and the judge given up the hunt for the pocket, colonel?"

"The judge is busy with other matters, but I'm still keen for the proposition. I reckoned if you'd let Barstow have Pete, perhaps I could borrow him for a little flyer in the hills."

"There was a time when the judge was willing to pay five thousand dollars for Riordan's Pete."

"Bryde was always too blamed liberal. In the last few weeks, Orden, that yarn about the pocket has fallen into disrepute. If you'd care to let Barstow have the burro I'd trade your old riding-horse for him."

"There's more than that in Riordan's Pete for me," said Orden.

He knew very well that what he had told Barstow had already been confided to Copperthorne.

"Well," went on the colonel, "providin' you was willing to sell the burro, what would be your lowest figger?"

"My horse, Fanita, five thousand dollars in cash and a half interest in the pocket," Orden answered calmly.

Barstow dropped his knife and fork with a clatter.

"You're crazy, Orden!" he cried

"No doubt of it, no doubt of it," agreed the colonel.

CHAPTER XVII.

REPRISAL.

LATE in the evening Orden borrowed a revolver from Yarnell and slept out the night on an improvised bed in the corral shed. In one of the stalls he had tied Riordan's Pete. Knowing Copperthorne so well, he feared the man might attempt to run the burro off in the dark hours.

Following breakfast next morning, the colonel came to Orden while he was scattering fodder for his live stock.

"Everybody seems to be kickin' a hole in that story of Riordan's pocket, Orden," he began, "but I'm just fool enough to think that everybody is making a mistake."

"That story has bled me to the tune of fifteen hundred dollars and a good horse," Orden answered, leaning on the fork-handle, "so I naturally feel that the pocket owes me something."

"Naturally," agreed the colonel, and pulled down his brows thoughtfully.

Orden had wondered, during his night in the shed, just how much Copperthorne knew about recent events at the Montezuma Mine. Did the colonel still consider Orden the same guileless youth who had dealt with Grimsby just out of Halemby's, or was he crediting Orden with the ability to play a deep game?

It was hard to answer this question from a mere study of the colonel's manner. Copperthorne had not the smooth shrewdness of Judge Bryde, but he far and away out-pointed Grimsby in mental caliber.

What Orden had in mind he was doing warily, feeling his way step by step as it were.

The colonel puzzled him.

"I know I am taking a long chance in trying to make up my deficit by means of that pocket story," Orden proceeded, "but it's my only chance."

"Why don't you play safe, then?"

"How do you mean?"

"Why, sell the burro for what you can get and let somebody else hunt for the pocket."

"I've got to break even," said Orden obstinately.

"I realize," continued the colonel, with a look of regret, "that the judge and I were in a measure responsible for the way you were hooked by Grimsby. I've got a heart, and your hard luck a while ago got right to me."

The colonel's voice grew sad and sympathetic.

"You were startin' out in the world, and to be stripped of all you had must have been real discouraging. My boy"—and he put out a hand and dropped it on Orden's shoulder in a fatherly way—"I'm going to reach down into my pocket and help you out. I'll give you five hundred, cash, for the Bonanza Burro. Furthermore, I'll throw in that horse of yours and the riding-equipment. How's that?"

"Colonel," was the firm answer, "the price of the Bonanza Burro is fifteen hundred dollars. In addition to that, I must have Fanita

and the riding-equipment. I own the mount that brought me, and I'll sell you that horse and gear for a hundred dollars."

"No," said the colonel.

"All right," countered Orden cheerfully. "I consider that you are entitled to Riordan's Pete, because you are the judge's friend, and it was the judge who told me how to reach the pocket with the burro as a guide.

"I have Riordan's pack-saddle, the prod he used, and the bell that Riordan hung around Pete's neck. They'll go with the burro for twenty dollars, just what they cost me."

"No," again said the colonel, and left the corral.

Orden passed the morning in the vicinity of the burro, watching ceaselessly to make sure Copperthorne did not resort to out-and-out theft. The colonel was intensely eager to secure Riordan's Pete. This fact was becoming more and more apparent.

A good dinner inspired Copperthorne with more recklessness. As he arose from the table he jumped his original bid to a thousand dollars. Orden declined the offer.

Later, at the corral, Barstow appeared unexpectedly with his bag of samples and the hammer.

"I hear, Orden," he remarked, "that Copperthorne has offered a thousand dollars for the burro that cost you only five. You ought to grab the money."

"There was a time, Barstow," Orden answered, "when the colonel considered the burro worth five thousand dollars. The price I paid for Riordan's Pete has nothing to do with the matter"

"The colonel has his ideas, and I consider them mighty foolish. He's that set in his way, though, there's no budging him. You'd better sell."

Orden shook his head. Barstow retired, evidently to consult with Copperthorne. In half an hour he was back again, and this time the colonel came with him.

"Now," said Copperthorne briskly, "let's figure out just what you want for Pete."

Orden took Uncle Sim's letter from his pocket and figured with a pencil on the back of the envelope. His memorandum was to this effect:

Original investment	$1,500.00
Fanita	
Riding equipment	
Real Riordan's Pete	5.00
Riordan's "relics"	20.00
Total cash outlay	$1,525.00

He showed the memorandum to Copperthorne

"That," said he, "is the cash I must have. In addition, you are to give me Fanita and the riding-gear. If you want the horse I rode to Ruby, and the accouterments, you will have to pay another hundred."

"You are a hard feller to deal with," growled the colonel.

"Then don't deal," returned Orden, recovering Uncle Sim's letter and putting it away in his pocket.

"You are takin' advantage of my friendship and generosity," complained the colonel.

"Then I am unworthy of it. Let's cut out that kind of talk and either do business or leave matters as they are."

Copperthorne stared hard at Orden.

"You're different from the young man I met at Halemby's," said he.

"A good thing, don't you think?"

The colonel sighed and took a fat wallet from his pocket. He was well supplied with funds, and slowly counted out fifteen hundred and twenty-five dollars. Then, after a moment's thought, he added another hundred to the bundle.

"I reckon there'd better be a bill of sale," he suggested.

"Two bills of sale," said Orden. "I'm ready to give you mine."

"Come into the hotel," Copperthorne requested.

The writings were made out and signed, and the cash turned over. Secure of his bargain, the colonel allowed his manner to change.

"If I don't make a fortune with that Bonanza Burro," he said exultantly, "I'll miss my guess. I had a notion to leave you alone and let you land on the prize, but when you got so cocky over the matter I made up my mind to push it through."

"They've been calling me the wise guy over at Montezuma," observed Orden.

The colonel chuckled. "I was the big wiseheimer, Orden," he answered, "when you were being rocked in your little cradle. I'm starting for Buenas Noches in an hour."

"Taking the burro with you?"

"It wouldn't do me any good to leave Pete behind."

"But I thought Barstow wanted to use Pete for packing ore samples?"

Barstow laughed.

"I was merely helping Copperthorne," he admitted. "He had his heart set on getting the burro and didn't think you'd deal with him."

"What was you reason for thinking that, colonel?" Orden asked.

"If you don't know, then I'll never tell you," replied Copperthorne.

Within the hour, the colonel started for Buenas Noches. The bell was strapped around Pete's neck, the saw-buck saddle was fast to his back, and Copperthorne carried the goad across the saddle in front of him. Also, he rode the horse that had once belonged to Grimshaw, alias Grimsby.

In the assay office, across the street from the hotel, there was a telephone. No telegraph line touched Ruby, and telegrams had to be sent over the long-distance wire to Phœnix.

Orden called on the assayer, who was empowered to take and transmit messages, and filled out a blank. The assayer went directly to the telephone and, while he was getting Phœnix, Barstow dropped in with some ore samples for assay. Barstow waited while the assayer delivered this into the transmitter:

"Prepaid message for Mr. George Orden, Los Angeles, California. Get that? No, no; O-r-d-e-n, Orden. Yes, that's right. Here's the message: 'Have recovered the lost fifteen hundred and the horse. Thought you might like to know.' Get that? 'Yes, fifteen hundred and the horse.' The message is signed 'Guy Orden.' Yes, I've collected for it here. Good-by."

The assayer turned away from the 'phone.

"Hello, Barstow!" he called. "More samples?"

The mining engineer did not answer. He was looking hard at Orden.

"I thought you said you didn't know your uncle?" he remarked.

"I don't," was the answer; "we're just getting acquainted."

Barstow appeared to be troubled about something. He followed Orden from the assayer's, and across the street to the hotel.

"I hope you understand," he said, "that I was helping Copperthorne for your own good?"

"Of course I understand it," Orden returned

"I didn't want you to start off on a wild-goose chase when it was so easy for you to sell the burro for a big price. Copperthorne seems to be fairly well fixed, and it was better for him to go fooling with that pocket than for you."

"Sure."

"You have been in Montezuma? I believe I heard you tell Copperthorne something about being there."

"I was in Montezuma for a month."

"Did you happen to meet Lee Harper and his sister while you were in the camp?"

"I met them, yes."

"We are old friends, Orden. I know Mollie's father. Possibly she mentioned me to you?"

A pang touched Orden's heart. He had seen enough of Rolfe Barstow to learn the sort of man he was.

"Yes, she mentioned you—just once."

"I wish you had told me about knowing Mollie before. I am riding over to Montezuma to-morrow, and then shall return here. Any message you'd like to send?"

"You might tell Miss Harper about my deal with Copperthorne. I think she'd like to hear that."

Barstow went back to the assayer's and Orden continued on into the hotel. Yarnell was in the little front office, and he began congratulating his guest on his success in dealing with Copperthorne. Orden cut him short.

"What do you know about the King Midas Mine, Mr. Yarnell?" he asked.

"I know all about it," was the answer.

"If you have a little time I wish you would give me some information regarding it."

"Sit down," said the landlord; "it's quite a yarn."

CHAPTER XVIII.

THE CRADDOCK CROWD.

"BART TRIMBLE first piled the monniments on the King Midas claim," began Yarnell after gnawing the corner from a plug of tobacco. "That was after Dad Hoover had opened up the Hoover's Pride proposition. Them two properties are on what's called Pima Ridge.

"Dad ought to have annexed the Trimble claim before Trimble got to it, but old Dad is so cock-sure of himself he didn't think that move was worth while. Not a man in these parts but knows there's a bonanza ledge in Pima Ridge. Dad Hoover found the outcroppings, and filed a location on what he reckoned was the vein.

"But Dad had trouble keepin' track of that vein as his workin's went down. Sometimes she'd be right under his men's picks, nigh on to a foot wide and assayin' a thousand dollars to the ton; then she'd melt into country rock with not even a limestone stringer to show where she'd been. It was real myster'ous, Orden, and Dad had every right to get plumb discouraged. He didn't, though.

"He hung to the Hoover's Pride like a dog to a bone, and he's hanging to it yet—his stamp-mill rotting by the old tailings dump, and the bats inhabiting his worthless old shafts and levels. He's a busted mine-owner, only he won't admit it. You see, Bart Trimble had put it over on him with the King Midas.

"Trimble, readin the indications a heap more intelligent than what Hoover did, took up ground in the right spot and picked up the lead that had got away from Dad through some tremendous big 'fault' that Nature threw into the ridge when it was made. The Craddock crowd, seeing that Trimble had a good thing, but not money enough to put it through, took over the King Midas at a handsome figure, and Bart Trimble went East to live in comfort, not to say luxury.

"The Craddock folks haven't done much with the Midas, but just held it and waited for a turn-over. They've had a good many offers, but none so far that's looked good enough. They— Just a minute"

Yarnell broke off and jumped to his feet. A disreputable-looking old man, tapping in front of him with a cane, had entered the office. The man's hair and beard were long, matted, and of a peculiar yellowish-gray. He wore a dirty flannel shirt and frayed blue overalls, and his bare feet were shod with carpet slippers. His eyes, wide and unblinking, were those of a man stone blind.

"Howdy, Bill!" called Yarnell, hurrying to the man and taking him by the arm.

"Fit as a fiddle, Hank!" was the answer, in a voice that cracked and wavered. "Shake you for the smokes, Hank!"

"You're on, Bill," said Yarnell, and piloted the shaking old man to the cigar-case and pushed a dice-box into one of his clawlike hanks.

The dice rattled and dropped.

"Don't you fool me, Hank'" warned Bill. "What's up?"

"Two sixes, Bill. You know mighty well I wouldn't fool you."

Bill won at the dice-throwing, and went tap-tapping away with his cane, half a dozen "stogies" in the breast-pocket of his flannel shirt and another, going full blast, between his toothless gums.

"That's him, Orden," remarked Yarnell. "That's Bill Craddock, the biggest man in this part of Arizona. He's got more money than he knows what to do with, and he's at the head of the Craddock crowd."

"I don't understand how a blind man can do much in a business way," said Orden.

"It ain't what a man sees, but what he thinks that counts. If Bill Craddock hasn't got eyes, he's got brains; and he's got brains to help him, too, and eyes to see for him.

"The Craddock crowd is a sort of syndicate, buying and selling all the time, and grabbing off profits. Their biggest sale was the Manhattan Mines to English parties for half a million. Bill made a pile out of that.

"To look at Bill Craddock you'd naturally think he didn't amount to shucks. But looks are deceivin'—in his case, anyways."

Orden did some hard thinking that night about the King Midas Mine, Rolfe Barstow and Uncle George. He made some plans; and, on the following day when Barstow left for Montezuma, he thought the time ripe for carrying them out. Mounted on Fanita, he took the hill trail and rode to Pima Ridge to interview Dad Hoover.

Hoover remained the stubborn champion of what people generally declared a lost cause. His derricks, his bunk-houses, his mill were rotting around him; his shafts had been planked over, and the cross-cuts and levels beneath were breaking through the shoring-timbers, and yielding to disuse and the destroying hand of time.

Yet, Dad Hoover, in a little shake-house that had once been his office, remained upon the scene like a grim and brooding spirit of blighted prosperity.

Orden found Hoover seated in the shadow of his "shake" wall. A folding-table had been set up in front of him, and he was dealing cards in a game of solitaire.

"Who are you?" he demanded sharply, looking up from under his shaggy brows.

"My name's Orden," was the answer

"Orden! Not George Orden, of Los Angeles?"

"No, I am George Orden's nephew."

"If you're here to spy on me, to find out what I've got or haven't got under ground, then you needn't let me detain you a minute. Keep a hiking."

Orden slid from his saddle, tied Fanita to a cottonwood-tree and came close and seated himself on a bench at the doorside.

"I want to talk with you, Mr. Hoover," said he. "I am not here as a representative of my Uncle George. If you will let me, I am going to tell you a few things about myself just to show that I'm entitled to your confidence."

"If you've anything to do with the Craddock gang—"

"I haven't. I'm a stranger in Ruby, and

I want to discover all I can about Bill Craddock and his operations."

Hoover made no answer, one way or another. Trailing a match across his pipe-bowl, he proceeded with his game. Orden began to talk.

He told his story, and started it in Castle Creek Cañon, with the simple-hearted Uncle Sim, fighting life and forgetting his failures in as lonely an existence as a man ever led. Hoover began to display a little interest. No doubt he likened the life of Uncle Sim, in the cañon, to his own weary round of days there on the ridge.

Orden brought Mollie into his recital, at the proper time; then he described his going out into the little world of southern Arizona, and how he had lost his "stake" to Bryde, Copperthorne and Grimsby near Halemby's. At this point, Hoover pushed his cards together and laid them aside

"It hardly seems possible a man could be caught like that!" he commented. "But Bryde is a hard man to beat. Go on."

Orden jumped his biography from Halemby's to Montezuma. His narrative dealt with the episode of the eight hundred dollars, and set forth the manner in which it had been lost and recovered. Hoover smiled.

Following this, the matter of the pearls was dwelt upon. The undoing of Grimshaw, otherwise Grimsby, was related. A hearty laugh was the tribute paid by Dad Hoover.

"That was good! That was A-One!" Hoover declared.

Orden brought his experiences down to the Bonanza Burro again. The sale to Copperthorne was related in all its details. Hoover thumped the table with his fist and shouted wild approval.

"Will you read these letters, Mr. Hoover?" Orden asked, taking from his pocket a bulky envelope containing the correspondence in which his Uncle George predicted his failure. "They will substantiate a great deal of what I have told you, and show you how I stand with Uncle George."

"What good is all this, Orden? I can't *sabe* what you're getting at."

"I want your confidence. I have an idea the Craddock crowd is trying to put something over on Uncle George. If you will tell me all you know about Bill Craddock, the information may help me to discover how matters are drifting."

Hoover read the letters carefully, Orden handing him one after another in serial rotation.

"I don't see what reason you've got for trying to help the hard-headed old money-grubber you call Uncle George!" declared Hoover, when the final letter was read.

"I just want to show him he hasn't corraled all the ability in the Orden family," was the reply. "I am going to force him to acknowledge that I count for something in the Orden line."

Hoover filled and lighted his pipe again and settled back in his chair. After a few moments of thoughtful silence he observed:

"You'd better take my advice, young man, and dig out of Ruby. Bill Craddock has got this town and surrounding country right in his grip. Around here a man does as Craddock says or Craddock breaks him. You'd stand about as much show fighting the Craddock crowd as a kitten in a cyclone.

"Let Craddock once discover that you're out to buck any of his plans, and he'd snap you across his knee the same as he'd do with a dried stick. Bill Craddock is a demon."

Orden remained silent.

"Don't I know?" Hoover blazed. "Craddock put the Hoover's Pride out of business! He has thrown a likely prospect into the scrap-heap, and me along with it, just because I wouldn't sell out to him at his price. Hanging's too good for Bill Craddock, I tell you!

"And how did he go about his dirty work? The mine was running and the stamp-mill was pounding out enough gold to pay expenses. We'd struck an ore-chamber, with rock that was mighty rich.

"Then high-grading commenced, and I lost thousands of dollars from thieving workmen; my mill was fired; and the batteries damaged so we couldn't run; what men I had were hired away from me, and I was forced to close down.

"Who was back of all that? Bill Craddock! The old scoundrel was led over here by one of his hired men, and again he offered to buy the Hoover's Pride. I told him I'd never sell, and that he wasn't big enough or lawless enough to put me out of business.

"I tried to start operations again, but Craddock continued to work against me, and it was no go. Then I started in to play this waiting game. I sealed the shafts, and I plumped down in my deserted camp to wait. For what, do you think?"

"For what?' Orden asked.

"For the time when Bill Craddock would be killed by some man whom he had fleeced, or die a natural death. That is my only hope in making an honest success here. I may go before Craddock does, but I don't think Fate

can play it so low down on me. You'll hear it said that the Midas has the gold reef I located on, here at the ridge."

Hoover brought his clenched fist down on the table.

"That's a lie! I know what I'm talking about. If I was free to do things, it would not be many years before Dad Hoover would find himself on Easy Street. Craddock and his gang believe that the Hoover's Pride is a busted proposition, and—"

"If he believes that, why does Craddock want the property?" cut in Orden.

"So he can sell it with the Midas. A job of salt. I know a thing or two, I tell you, Orden. Bill Craddock is a sure-thing gambler. He and his outfit are putting over a scheme on your Uncle George."

"By selling him the King Midas Mine?'

"How else? Craddock's right-hand man is in Los Angeles this minute, and George Orden's expert is here in Arizona. That expert is Barstow, and on his report your uncle will deal. The representative of the Craddock gang in Los Angeles is this Judge Bryde you've been telling me about."

"Ah!" muttered Orden, and saw another light

CHAPTER XIX.

UNEXPECTED NEWS.

ORDEN had proceeded in the right way to place himself on a friendly footing with Dad Hoover. The mine-owner gave the young man his confidence—up to a certain point. Hoover admitted freely the bad blood between himself and Bill Craddock, and he was willing to help in preventing the sale of the King Midas to George Orden; but, if he had positive knowledge regarding the location of the gold reef in Pima Ridge, he kept the information to himself. His mere statement that he *knew* the Hoover's Pride and not the King Midas was the real mine was not a sufficient basis for Guy to act upon in warning his Los Angeles uncle.

Hoover continued to maintain that, clever though he believed Orden to be, fighting the Craddock crowd was too hard a proposition for the young man to undertake. Orden, fresh from his small successes, thought otherwise. He was eager to play a big game, and perhaps he underrated the difficulties.

While Barstow was away, the chance offered for a little quiet work. With a hammer and a supply of ore-sacks, Orden left the Ruby House by night and made his way to the King Midas side of Pima Ridge.

There was a five-stamp mill, in good working order, at the mine. Other necessary buildings were there, too, all in a good state of repair. No work was being done, pending negotiations for a sale of the property, and a trusted aid of Craddock's was in charge as watchman.

Orden eluded the watchman's eyes in the dark, gained the main shaft and crawled down the shaky ladders. For hours he labored in the levels and cross-cuts, burning candles for light and examining walls and chipping samples. He got away as successfully as he had come, and next day his samples were in the hands of the assayer.

"Where'd this stuff come from?" the assayer inquired.

"From out in the hills," was Orden's indefinite reply.

"Bill Craddock was in here asking about it," the assayer confided. "Not much goes on in Ruby that Bill, blind though he is, doesn't get next to."

"Why doesn't Craddock come to me if he's so anxious to find out what I'm doing?"

"He'll come to you, all right."

When Orden went back to the assayer's for his reports, Bill Craddock was in a chair in the office, his cane across his knees and one of his favorite "stogies" between his lips.

Of all the samples Orden had brought for testing, only one showed a trace of gold—and that was no more than a trace.

"Here's Mr. Orden, Bill," said the assayer.

Craddock flung up his head and his sightless eyes turned in the direction from which the assayer's voice had come.

"Come over here, young man," Craddock requested. Orden, tucking his certificates in his pocket, stepped closer. "I'm told you're the nephew of George Orden, of Los Angeles," the blind man went on.

"Yes."

"What's your business with Hoover? I learn you went over to the Midas yesterday."

"Merely a friendly call, Mr. Craddock."

"Huh! If you know when you're well off, you'll leave Hoover alone. If you're in with him, you're out to double-cross me. You're leaving Ruby to-morrow."

"Am I?" returned Orden

"That's what I said. After to-morrow it won't be healthy for you around here. I sent a wire to Los Angeles about you, and that's what I get in reply."

One of the clawlike hands groped for a

pocket and brought forth a folded yellow slip. The telegram was passed to Orden and he opened it and read:

WILLIAM CRADDOCK,
Ruby, Arizona.

Barstow my sole representative. Disown any connection, business or otherwise, with Guy Orden.

GEORGE ORDEN.

"Get that?" inquired Craddock significantly.

"It's plain enough," said Orden, returning the telegram.

"A word to the wise and a kick for a fool. Take my advice and move on by to-morrow. I don't like your prying."

Orden, feeling that his temper might get away from him, turned on his heel and left the assayers. He was very well satisfied that the King Midas Mine was worthless. His samples had been taken with care, and there was no reason to doubt the accuracy of the assayer's work. If Craddock had suspected the source of the samples, and if he had influence with the assayer and could tamper with the reports, the certificates would undoubtedly have shown large values.

The telegram to Craddock failed to lessen Orden's zeal in the service of Uncle George. The young man was pressing on, regardless of the hostility shown for him by the hard-hearted business man in Los Angeles. A principle was at stake. It was not so much helping Uncle George to side-step a swindling plot, as to prove that his nephew had ability to uncover the real facts, that animated Orden That was the point: to relieve Uncle George of a false impression.

On returning to the hotel from the assayer's, Orden received the surprise of his life. Some one, sitting in a chair in the office and apparently waiting, started up at his entrance and hastened toward him. It was Mollie Harper!

"Mr. Orden!" exclaimed Mollie breathlessly. "Oh, how glad I am that you have not left Ruby! I was afraid I would not be able to see you."

Her face was white and tired. A quirt dangled from her right wrist, and her short riding-skirt was sprinkled with dust.

"You came here to see me?" inquired Orden after he had recovered from his surprise sufficiently to give the girl a greeting.

"Yes," she answered. "I started early this morning, and reached Ruby only a few minutes ago. It was necessary for me to come—to warn you."

"Warn me?" he echoed.

They were alone in the office. Mollie peered about them carefully to make sure of that.

"Grimshaw was acquitted!" she breathed, a gleam of fear in her eyes.

"Acquitted!" exclaimed Orden. "Why, I thought Leavitt had all the evidence necessary to convict him."

"Everybody thought so, but Grimshaw received a good deal of money, from some unknown source, and the best lawyers defended him. The supposed pearls were examined and found to be spurious; but Grimshaw was able to make it appear that he supposed them to be genuine, and that he had borrowed the money from Leavitt in good faith. So—he is free."

Orden saw how weary the girl was, and how the long, hard ride had worn upon her.

"You ought to rest," said he gently; "it was not necessary for you to put yourself out, in this way, just to bring such news to me."

"There is more," she said excitedly; "I can't rest until I have told you all, Mr. Orden."

She sank into the chair to which he had led her.

"It is mighty good of you to take all this trouble for me, Miss Harper," he remarked, seating himself at her side.

"I am only repaying you for kindness extended to Lee and me," she returned. "I know how to be grateful. Mr. Leavitt suggested that some one ought to be sent to you with the news about Grimshaw."

"And instead of getting some one to come, you came yourself!"

"It was necessary," she insisted. "There are other things to be told you—and no one else knows what they are. First, I must let you know what Mr. Leavitt said. Grimshaw has sworn to get even with you. From now on, it seems, he is making that his business. Mr. Leavitt thinks he is a desperate scoundrel, and that you should be put on your guard."

"I'm not worrying about anything Grimshaw can do," said Orden lightly.

"But you will be careful?"

There was a note of anxiety in Mollie's voice that stirred Orden deeply. "If it means anything to you," he began, "then, of course, I—" Something in the blue eyes brought him to a stop.

"You must know it means a great deal to me," said Mollie, with a simple directness that quite disarmed him.

"How did you know I was in Ruby?" he asked, shifting the subject.

"Mr. Barstow told me."

"I had forgotten Barstow," he muttered moodily. "When is he coming back here?"

"He is not coming back. He left on his return to Los Angeles just before I started from Montezuma, this morning."

There was a queer note of restraint in the girl's voice, and a sudden sadness crept into her haggard face. Orden wondered at this.

"Did Barstow tell you how I had sold the real Bonanza Burro to the man who had helped dupe me near Halemby's?" he queried

"He told me that. I should have thought, inasmuch as you had the real burro, that you'd have looked for the pocket yourself."

"I did look for it," he said smiling. "What is more, Miss Harper, I found it. It was a rifled pocket, and not an ounce of gold was left. Copperthorne didn't think it worth while to ask me if I had been treasure-hunting with Riordan's Pete. He just bought the burro—and I did not do any explaining. Would you call that sharp practise? All I took from Copperthorne was what he and his friends had taken from me."

"I suppose," Mollie observed, "that people generally would approve of what you have done. I am more concerned about the fact that you will now have another desperate enemy to deal with—Colonel Copperthorne. Dangers are piling up around you, Mr. Orden. I am here to ask you to leave for Los Angeles at once. Get out of the country as quickly as you can."

"Go to Uncle George before I have made good?" he asked. "I can't do that, Miss Harper."

"I can place information in your hands that—that your Uncle George will greatly appreciate. You will go to him with news that will enable him to save a hundred thousand dollars. Wouldn't that be 'making good?'"

Orden stared in amazement. "Information?" said he. "What sort of information?"

"Your uncle is negotiating for the purchase of a worthless mine; he—he—" Mollie's voice choked and tears sprang to her eyes. Impatiently she fought down her emotion and proceeded. "You must hurry to Los Angeles, Mr. Orden, and tell your uncle that the King Midas property is being manipulated by a gang of swindlers. You must reach Los Angeles with this information before—before your uncle receives Mr. Barstow's report."

There were tears in Mollie's voice, even though she contrived to keep them out of her eyes. Orden was startled at the implication contained in her statement. While he sat with dumb lips, twisting and turning the fateful words about in his mind, he heard the *tap, tap* of a cane at the threshold.

Craddock was entering the office, groping his way with the stick. There was something unnerving in the way that blind man happened to be around when his wily plans were endangered.

"Are you there, Orden?" Craddock called. "I am told a young woman has called to see you. Is she here, too, Orden?"

CHAPTER XX.

RUNNING THE BLOCKADE.

ORDEN was heartily tired of Craddock's meddling. The old man's dragooning, just at that moment, struck sparks from the young man's temper.

"Yes, I'm here," said Orden, stepping in front of Craddock. "You're going to a good deal of bother in trying to keep track of me. Don't you think it's about time you spared yourself this unnecessary trouble?"

The wizened, leathery face folded into innumerable little wrinkles. A grim expression evolved itself out of the criss-crossed lines, and to this the vacant, staring eyes lent a touch of horror.

"Beginning to fight back, eh?" cried Craddock. "You're bound to be a fool in spite of all the warnings I've given you! I told you to leave town. Well, I've changed my mind. You will stay right here in Ruby until I give you permission to leave. Try to disobey orders and you'll be sorry. The blockade applies to the young woman, too."

"Listen, Bill Craddock," returned Orden angrily: "You're a power in this part of Arizona, but you're not more powerful than the law. I've had enough of your bullyragging. I'll come and go as I please, and without let or stay from you."

The old man burst into a cackling, gruesome laugh. "You're headed right to come out the little end of the horn, my laddybuck," he said, and turned and began *tap-tapping* his way out of the hotel.

"Who is that horrible old man?" asked Mollie with a shiver.

"He is the notorious Bill Craddock," Orden answered, "the man who, with the aid of Judge Bryde, is trying to sell the King Midas Mine to my uncle. The other time I saw him, he gave me twenty-four hours to get out of town; now he forbids me going, and declares a blockade!"

"Can't you understand why? He suspects that I have come to urge you to start for Los Angeles and carry important information to your uncle. That is why he orders you to stay in Ruby, Mr Orden!"

"I suppose so," agreed Orden.

"Is he powerful enough to make good his threats?"

"He seems to have this part of the country under his thumb, but I'm not afraid of him. I'll run his blockade if I have to. Fanita can show her heels to any horse in southern Arizona."

"Perils are thickening around you!" Mollie whispered. "There is Grimshaw, and soon there will be Copperthorne, to help Craddock in his plots. Something tells me that you will run a terrible risk in attempting to leave Ruby. Why not send a telegram to Los Angeles?"

"And let Craddock think that I am afraid to make an attempt to get out of town?"

"Why should you care what he thinks, Mr. Orden?"

"You thought, a little while ago, that I should not lose any time getting away from here!"

"That was before Craddock said what he did." The girl was desperately in earnest. "Can't you see in what a fearful position you are placed?" she went on. "I believe it is safer for you to remain in Ruby and defy Grimshaw, than to try to leave Ruby and defy Craddock. Please," she begged, resting a hand on his arm, "send a message to your uncle, at once"

"What shall I say in the message, Miss Harper?" he asked, yielding to her entreaty.

"Say there is no gold in the King Midas Mine; and—and—" Her voice grew faint and finally failed her.

"And—" Orden urged.

Mollie gathered her strength for a supreme statement: "And that the report of the mining engineer is false, and made with the deliberate intention of aiding the swindlers!"

Orden caught his breath. Mollie's face was hueless, and reflected in every line the anguish her words had caused her.

"How do you know that?" Orden asked huskily.

"Don't ask me!" she whispered. "I know it is the truth and—and that's enough. Send the telegram, Mr. Orden, and your uncle will escape the snare that has been set for him. It ought to help you."

"I'll go across the street and send the message," said Orden.

He was writing out the telegram in the assay office when the assayer emerged from his furnace-room. "Sorry, Orden," said he, "but there's no use trying to send any telegrams."

"Why not?"

"Wire's down and I can't get Phœnix."

Orden tore up the half-written message.

"Rather odd that the wire should be down just now, don't you think?"

"I'm free to say I don't understand it; but I've been trying for hours to get Phœnix and send a message for Bill Craddock."

This was a bluff on Craddock's part, Orden was sure. It was meant to indicate that Craddock had had no hand in putting the telephone wire out of commission.

"Of course it was Craddock!" Mollie declared when Orden reported

"We might have known that his first move would be to prevent any information leaking out of Ruby by wire."

"I'll go to Phœnix," said Mollie, "and send the telegram in your name."

"No," objected Orden firmly. "You heard Craddock say that the blockade applies to you as well as to me. You have already taken too many chances. Have you secured a room here?"

"Yes"

"Then go to it and get a little rest. There is nothing to be done for a while. It will be impossible to run the blockade before night."

"You are determined to try that?"

"It is the only way to beat Craddock and make a play for Uncle George."

"If you get through to Phœnix," Mollie suggested, "why not go on to Los Angeles yourself?"

"I am not ready. Uncle George will receive a telegram, but he has said that he would not receive me."

"What has he against you?"

"I think he is striking at Uncle Sim over my shoulders. Uncle George would receive a telegram from me, but I doubt whether he would act upon any tip I might send him."

"So much the better," said Mollie.

Orden's wits were puzzled for a moment. Then he smiled

"You think it would be a bigger feather in my cap if Uncle George disregarded my warning and then found himself buncoed by Bryde and Craddock?"

"It would prove," asserted Mollie, "that you were wiser than your Uncle George. The result would make a stronger appeal to him. On the other hand, if he accepted your tip and acted on it, he would always think that you might have been wrong. And the expert

he sent to Ruby to examine the King Midas property," Mollie added in a low tone, with face averted, "would not be positively convicted of double-dealing." She arose suddenly and started for the stairs. "I will go to my room now," she finished.

Orden sat in the office for some time after Mollie had left him, deep in thoughts not wholly unpleasant. What had happened in Montezuma, while Barstow was there? In one night the mining engineer had been stripped of his integrity and had lost the love of Mollie Harper. How had this chanced? Mollie was still suffering from the wound, but she was bravely shouldering the consequences of her broken faith.

Barstow had told Orden that he would return to Ruby. He may never have had such an intention, but have spoken a lie to shield some ulterior purpose. On the other hand, if he had really planned to return to Ruby from Montezuma, it was possible he had taken alarm at something Mollie had said and started post-haste for Los Angeles.

Orden thrust these reflections aside to deal with his plans for running Craddock's "blockade." Removing his riding-gear from the pegs in the wall, he took Mollie's saddle and bridle from under the stairs, where she had thrown them, and hung up the accouterments in place of his own. His saddle-blanket he looped over the pommel of Mollie's saddle. Then, with Mollie's blanket and Fanita's trappings under his arm, he stole out to the corral shed and concealed the gear among the hay-bales.

Mollie had supper in her room that night, and Orden ate alone at the table, where formerly Copperthorne and Barstow had been his companions. Feeling that he was watched, and that his every move was noted and reported to Craddock, he tried to appear at his ease and so disarm suspicions regarding his plan to clear out of Ruby.

Until nine o'clock he lounged around the office, talking with Yarnell as though he intended to remain at the Ruby House indefinitely. What were Yarnell's rates by the week? And what were the prospects of securing work in the quarries or the mines? The landlord seemed impressed with the idea that he had a steady boarder.

At nine Orden went up to his room. A door opened as he made his way through the upper hall, and Mollie stepped quietly out in front of him.

"You are leaving to-night?" she asked in a whisper.

"Yes," he answered. "I am glad I have a chance for a last word with you, Miss Harper. If I can get away from the Craddock crowd, there will be no reason at all for them to keep you here. In the morning I hope you will start back to Montezuma."

"Where is your riding equipment?" she went on, thinking only of him, apparently, and not at all of herself.

"I hid it in the corral shed, several hours ago."

"Don't you suppose Craddock is having Fanita watched?"

"Perhaps. If that proves to be the case, I must evade the watchers in some way."

"Are you armed?"

"No. That would only make matters worse if I am cornered. It is only right for me to tell you, Miss Harper, that I suspected Barstow was crooked, and that I took samples from the King Midas Mine, had them assayed and found the mine was worthless. So you need not blame yourself for anything that—"

"What makes you think I might blame myself?" she broke in.

"Never mind," he answered gently. "There is one man in this section who hates Bill Craddock and his gang, a man who is a friend of mine and, I think, would be a friend to you in case you might need one. His name is Hoover, they call him Dad Hoover, and he can be found at Pima Ridge."

"Why are you telling me that?" she asked tensely.

"So that you may get safely out of this nest of treachery, if you happen to find it difficult. Good-by, Mollie, and I thank you from my heart for all you have done."

He clasped her hand impulsively and then passed quickly on to his room. Still lingering in the hall, the girl listened and watched. From Orden's sleeping-quarters she heard sounds that indicated the stealthy opening of a window. From the office below, a moment later, she heard the stealthy *tap-tap* of a cane on the floor. Her heart fluttered in her throat. Bill Craddock had come to the hotel! What had brought him, at that critical moment?

She stepped to Orden's door and knocked softly. There was no response. With a light touch on the knob she pushed the door open. There was moonlight in the room, and she saw that Orden was gone. Gliding to the open window, she looked out. He must have dropped from the window-sill to the ground. Her gaze turned in the direction of the corral, and presently she saw a man come through the gate leading a horse. It was Orden with Fanita! He had worked quickly, and had not been

interfered with. Under her eyes the dark figure vaulted into the saddle and rode away into the shadows.

Drawing a deep breath of relief, Mollie stole back into the passage. She could hear the cracked, high-pitched voice of Craddock, and the deep, obsequious tones of Yarnell All was well, the girl felt assured. While the leader of the scoundrelly pack was talking with the landlord in the office, Orden was racing away on the trail to Phœnix!

Mollie went on into her room, the room at the front of the building, and sat in a chair by an open window. Then, suddenly, the distant report of a firearm reached her ears. She gasped, and her heart fluttered with dread.

What was that? Orden was not armed—he had told her so. Had he encountered peril at the very moment he was leaving his perils behind him?

Through the night's stillness was borne a wild clatter of hoofs. At first faint, almost indistinguishable, the sound grew louder and louder. A riderless horse came flying along the one squalid street of the town and slowed down, foam-flecked, to a bewildered halt in front of the hotel

The door opened and Yarnell rushed out and seized the horse by the bits.

"What is it, Yarnell?' called Craddock from the door

"Blamed if I can understand this," answered the landlord excitedly. "This is Orden's horse, and I reckoned the animal was in the corral.'

"Where's Orden?"

"Give it up. He went up-stairs to bed, just before you came."

"That's where he fooled you—and got fooled himself," said Craddock.

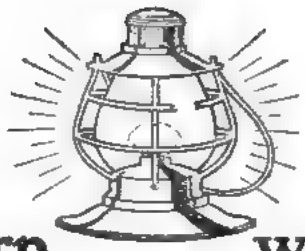
A sob escaped Mollie's lips and she dropped her face in her hands

(To Be Concluded.)

BEAUTY SWINGS THE CONTROLLER.

AT THE BUSH TERMINAL, PORT OF NEW YORK, WHERE ALMOST EVERYTHING IS OPERATED BY ELECTRICITY, GIRLS ARE BEING TRAINED TO RUN FREIGHT-ELEVATORS, SWITCHING-ENGINES, WINCHES, TRACTORS, AND CRANES AND THEY ARE FILLING QUICKLY THE GAPS LEFT BY MEN WHO ARE CALLED TO WAR

By the Light of the Lantern



Ask us what you want to know

WE want to be as useful as possible to our readers, but, because of the great popularity of this department, we are obliged to impose certain restrictions. It is limited to the answering of questions of an informative, technical, or historical nature concerning the railroad business and allied occupations only. We cannot answer requests for positions or give information regarding employment. All letters should be signed with the full name of the writer, as an indication of his good faith. We will print only his initials. The editor begs that readers sending in questions will not be disappointed if the answers do not appear as early as expected. It frequently takes weeks to secure correct answers, owing to the complexity of the questions. All questions are answered free of charge. The editor earnestly requests his readers to bring immediately to his attention any errors they may find in this department. He reserves the right to refrain from answering any question.

FARTHEST NORTH RAILROAD.

L. S. B., Camden, New Jersey.—The farthest north railroad in the world is said to be that between Nome and Kougarok in Alaska, a distance of about 80 miles. The government imposed a tax of one hundred dollars a mile per annum on the line, and it failed to pay expenses.

Peter Yeager, a mail contractor, leased the road. He constructed light cars that ran on four wheels, and teams of ten or more dogs furnished the motive-power, and hauled several tons of freight and mails, making the round trip once a week.

The government is projecting a road to run from Nome to the Alaska coal-fields, and it is expected that some day the Seward Peninsular Railroad will again become a steam road instead of a dog road

Probably the Reykjavik Harbor Line Railway in Iceland is now the most northern line in operation. This little road is of three feet gage, has two locomotives, and is used to carry materials for the works on the new harbor at Reykjavik, the capital of Iceland. The line began operation April 17, 1913.

CORRESPONDENCE SCHOOLS.

J. O. L., Tomahawk Lake, Wisconsin.—As we are not familiar with the claims made by the correspondence school that you mention, we cannot answer your question whether they can "deliver the goods or their standing with railroad heads," as you say.

What do they claim? Have you visions of a couple of weeks' study and immediate graduation to a position of comparative ease and little responsibility?

In the first place, the roads that employ men for the position you mention are indeed few, and while every branch of railroad service offers unlimited opportunities for advancement, it is unthinkable that a man without some practical railroad experience could step into a position of responsibility of any kind because he has completed a prescribed course of study.

In the railroad business as a whole, promotion is what counts; and it is only reasonable to assume that the man best qualified, whether it be through a course of study from the experienced hands of a correspondence school, or otherwise, is likely to be better able to grasp the opportunity when the chance for promotion arrives.

SAFETY AGENTS.

T. W. K., Pinebluff, Wyoming.—As you have not told us anything in regard to your device, we cannot advise you as to the merits or value of your idea. You may feel assured, however, that the railroads will adopt anything that makes for safety

You may obtain an expression from some of the safety agents now employed by most of the larger railroad systems, if your idea is something in which they would be interested; or if your scheme has something to do with railroad safety from an operating standpoint, would suggest your submitting your plan to H. W. Belnap, Chief, Division of Safety, Interstate Commerce Commission, Washington, District of Columbia.

ROAD FOREMAN.

J. S., Lakota, North Dakota.—In the territory to which you refer, and on the roads mentioned, the road foremen of engines are: On the Southern Railway, D. C. Dickert, at Alexandria, Virginia, and F. A. Metler, at Washington, District of Columbia; on the Richmond, Fredericksburg and Potomac, W. T. Bryant, at Richmond,

Virginia; on the Chesapeake and Ohio, at Richmond, H. H. Harton, and W. F. Johnston

DROP TESTS.

W. H. W., Philadelphia, Pennsylvania.—Under the specifications and standards of the American Railway Master Mechanics' and the Master Car Builders' Associations certain forgings, car and tender wheels, *et cetera*, are submitted to drop-hammer tests to ascertain the strength or imperfections in the castings

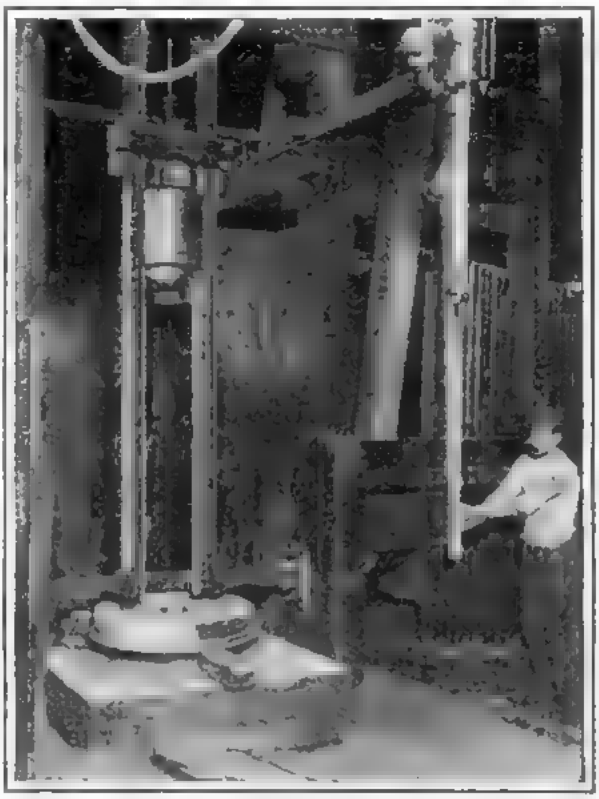
Rules governing the drop test provide for certain weights to be dropped a certain number of times. For instance, in the case of cast iron tender-wheels weighing 625 pounds, a weight of 200 pounds is dropped from a height of 9 feet ten times, whereas for a wheel weighing 725 pounds the same weight hammer is dropped 12 feet twelve times

When the wheels are ready for inspection, they are arranged in groups, all wheels of the same date being grouped together; and for each 100 wheels which pass inspection, two are selected at random and subjected to the drop test, as above

If any of the wheels so tested fail to meet the requirements, the entire group is rejected. In conducting the hammer test for wheels, the wheels are placed on three equi distant supports with the flange pointed downward, so that the hammer or top will strike centrally on the hub

During the process of manufacture, the makers submit their wheels to such tests so that they will be sure to meet the requirements. Our illustration shows the hammer test being applied to the Davis steel wheels.

A 500-pound weight is being dropped upon the hub. The test is sufficiently severe to reveal any imperfections in the castings, and at the same time does not permanently affect the strength of the wheels.



ONE OF THE MOST EFFECTIVE METHODS OF ASCERTAINING STRENGTH OR DISCOVERING IMPERFECTIONS IN CAST INGS IN TENDER-WHEELS IS TO SUBMIT THEM TO THE DROP HAMMER TEST

SPEED!

W. J. P., Windsor, Ontario, Canada, writes: While I think your magazine is the best of its kind on the market to-day and contains some very interesting articles, from a railroad man's view-point, still I cannot help thinking that a little more space devoted to articles relating to railroading in European countries would prove interesting to a great many readers. For instance, when a fast run is made over an American road, it is usually referred to as a world's record run, which in a great many cases does an injustice to British railroads

In your September number, the statement of Mr. McGarry, in his article entitled "Ran Her 90 Miles in 84 Minutes," that old-timers say that this is the fastest run for the distance ever made by a locomotive is hardly correct. A few years ago a special train on the Great Western Railroad (England) made the distance of 118½ miles from London to Bristol in 90 minutes flat Schedule time for this run is 120 minutes. The engine-driver's name was Burden

We want to thank you for your very interesting letter, and would have published it in full, giving the details of the excellent high-speed runs made by your father, and also by Engineer Burden from London to Bristol, if it were not for the fact that the distance has been covered in faster time than you give, and would only tend to complicate matters further

You give the fast time of 90 minutes for the 118½ miles between these two points, but the run was made in 84 minutes in July, 1904

We agree with you in your criticism of "fastest time for the distance," as given by William A McGarry in his article, "Ran Her 90 Miles in 84 Minutes," in the September issue of the RAILROAD MAN'S MAGAZINE. According to the author of this article, Engineer Loughrey's run was at an average speed of 64⅜ miles per hour

As a comparison to show how inaccurate some so-called speed records are: in January, 1911, a special train over the Pennsylvania ran from West Philadelphia to Jersey City, 90½ miles, at an average speed of over 67 miles per hour. We mention this one because it closely approximates, characteristically, what Mr. McGarry tells us "old heads say is the fastest for the distance."

We could mention any number of runs approximating 100 miles, recorded in much faster times than those quoted above

That able writer, Charles Frederick Carter, in his article, "Big Railroading," in the September issue, tells us that the New York Central speed of 112½ miles per hour, made a quarter of a century ago, stands unchallenged.

He tells us that this speed was sustained for a distance of 36 miles.

If our records are accurate, the claim made at the time of the run was that one mile was done at that rate of speed at Crittenden, New York, and not for the entire 36 miles between Batavia and Buffalo. Mr. Carter also tells us that the train was equipped with speed-recorder, *et cetera*, but that is real news to us. We quote *Railway and Locomotive Engineering* of June, 1893, when that periodical was known as the *Locomotive Engineer:*

"For a week or two before being sent to the Fair, Engine '999' was run on various trains to demonstrate her power and speed. On May 9 she took the Empire State Express clear through from New York to Buffalo, a distance of 440 miles, on time.

"The train was 28 minutes late on leaving Rochester, and it is claimed the run of 69 miles from there to Buffalo was made in 68 minutes, and one mile was made in 35 seconds, being at the rate of 102.8 miles per hour.

"The train consisted of four cars, the weight being 362,000 pounds.

"On another run, passengers in the train claimed that one mile was made in 32 seconds, which is over 112 miles an hour. These claims of terrific speed are not official, and we do not believe that the engine ran 100 miles an hour, but has probably made the highest speed of any locomotive in the world"

If the distance was actually 36 miles with speed recorders and official clockers, as according to Charles Frederick Carter, it will thus be seen that new light can be thrown on speed records even a quarter of a century later.

If it was only one mile, then even this "supreme" burst of speed was exceeded on the Plant System, March, 1901, 5 miles, Fleming to Jacksonville, in 2 minutes 31 seconds, or 120 miles per hour.

Also, July, 1904, Philadelphia and Reading, Egg Harbor to Brigantine Junction, 4 4/5 miles, at the rate of 115.20 miles per hour.

In any event, these three speeds were the highest ever attained by steam locomotives, and all these were exceeded by the electric locomotive in the Berlin-Zossen tests, which were certainly official, in 1903, when for 15 miles the electric engine averaged the tremendous speed of 130 miles per hour.

RAILROAD FINANCING.

S. B. R., Fitchian, Illinois.—Can only suggest that you submit your proposition to local banks or other financial institutions in your district, who, on account of their situation, will be better able to pass on the merits of your plan, and to advise you as to the proper course to pursue, than we, who know nothing whatsoever of your proposition.

R. R. MEN BEGIN YOUNG.

G. L. O., Marysville, Ohio.—We don't like to discourage a man from attaining his ambition, but after examining your record and the rapid promotion to your present position, we do not deem it advisable for you to think of entering railroad service, even though the railroad companies are now employing men of more advanced years than heretofore, due to war conditions.

The time for you to have thought of railroading as a profession was twenty years ago. Read our answer to J. O. L., above; you will then probably understand why this advice is given in this instance.

THE TRAINAGRAPH.

T. W., Stamford, Connecticut.—Trainagraph is the trade name of a new recording device now being used on several roads, by means of which an accurate record is made of the condition and operation of the brake system of a train. It turns out a graphic record of the brake-pipe, auxiliary reservoir, and brake-cylinder pressures, and also indicates how every application of a brake was made in handling a train.

It shows every weakness of the air-brake system of the train when any exists. It can be applied to the locomotive or any car in a train. As its records are unchangeable and beyond controversy, their general adoption would be of utmost importance in the investigation of accidents.

This instrument shows the exact reduction made with each movement of the engineer's hand on the brake-valve; in other words, it tells the story of what the engineer did, the time he did it, and its exact effect on the entire train-line.

LARGEST RAILROAD YARD.

H. S., Chicago, Illinois.—We are indebted to Mr H. S. Moore, one of the valued readers of this feature of the RAILROAD MAN'S MAGAZINE, for the following data in regard to the largest railroad yard referred to in our answer to A. B. J., Detroit, Michigan, that appeared in the July number:

The largest railroad yard in the world is the clearing yard of the Belt Railway of Chicago. It is a hump yard, and has 58 tracks on each side

of the hump, which are called the classification yards.

Yards A and B on the east side, and Yards C and D on the west, switches are electrically operated from a tower. The tracks hold about 70 cars each

The receiving yard on the east side has 16 tracks holding about 75 cars each. The despatching yard on the east side has 24 tracks holding about 75 cars each

The west receiving yard has 16 tracks holding 65 cars each. The west despatching yard has 20 tracks holding 75 cars each

There is a small storage yard on each side of the hump.

From 10 to 15 cars per minute can be handled over the hump. The yards are about 4½ or 5 miles long, and are the development of the C. W T. yards. About 15,000 cars can be stored here

LARGEST GRAIN ELEVATOR.

M. B., Oneonta, New York.—The largest grain elevator in the world is on the Buffalo Division of the New York Central, about two miles south of the Ohio Street freight station. It is known as the Concrete Central Elevator, and an excellent view of it is given in the accompanying illustration.

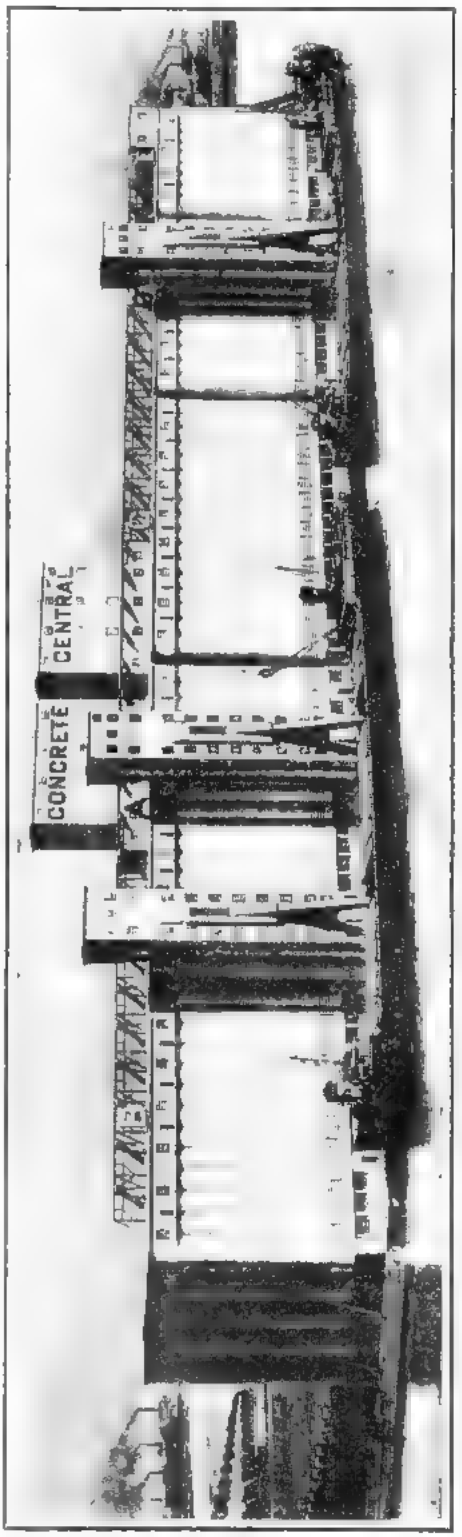
It has a storage capacity of 4,500,000 bushels of grain

Charles Frederick Carter, in his articles on "Big Railroading," gives us the details of this great structure, which, as to size, surpasses anything of its kind in the world. It is so divided with bins that lots ranging from 4,000 to 25,000 bushels of the various grades or quantities can be stored up to the full capacity of the entire plant

The Concrete Central Elevator has water on three sides and the New York Central on the fourth side. It is 1,400 feet long, and has an extreme height of 200 feet, although the bins are only 95 feet high

On one marine front three marine towers 165 feet high can be used to unload three vessels at the same time, or all can be concentrated on one; while still another tower at one end can unload a fourth vessel, making the total unloading capacity 100,000 bushels an hour.

There are five loading-tracks beside the elevator with a capacity of twenty-one cars at once. Cars are loaded at the rate of 70 an hour, or, say, 80,000 bushels of wheat. This one elevator can furnish almost a solid train an hour.



LARGEST ELEVATOR IN THE WORLD CAPACITY 4,500,000 BUSHELS. ONLY RAILROAD REACHING IT DIRECTLY IS THE NEW YORK CENTRAL. CAN LOAD 70 CARS AN HOUR

INJECTOR TROUBLES.

E. M., Bertrand, Missouri.—You have not told us what kind of an injector you are handling, and it would be difficult for us to explain the different troubles the various types of injectors might be subject to.

As a general rule, when the injector fails to give good service, it will be due to improper treatment, being wrongly located, or because too much is expected of it. It is an established fact, however, that in every instance in which a reliable boiler-

feed is required, an injector can be found that will do the work, if proper care is exercised in its selection.

Some injectors will not work well when the steam pressure is too high. In order to work at all, the injector must condense the steam which flows into the combining-tube.

Hence, when the steam pressure is too high, the heat is great, and it is therefore more difficult to secure complete condensation. For this reason, when using high-pressure steam, the best results are obtained by using cold water. When the feed-water is too warm for the injector to work well, a reduction in pressure, and consequently in the temperature of the steam supplied to the injector, will have the desired effect.

In all injector troubles the failure of the water to reach the injector is the most common, and if there is water in the tank and the surface be not frozen, as it may readily be in winter, the trouble will likely be by reason of a leak in the suction-pipe or by clogging of the strainers.

A heated suction-pipe also often refuses to supply water in sufficient quantity for the effective use of the injector. In cases where the injector lifts the water and fails to force it into the boiler, the trouble should be readily evident by the behavior of the injector.

If the steam should blow back into the tank, it will either be caused by reason of the overflow-valve being partly closed—thereby preventing a ready escape for the combined steam and water which is necessary until the mixture of the two bodies has accumulated sufficient momentum to pass through the check-valve opening into the boiler—or it may be caused by the sticking of the check valve, which, though rarely the case, sometimes happens in instances where impurities in the water form solutions and act like glue in joining the check-valve to the valve-seat. A slight tap on the check will sometimes relieve a sticking valve.

Some simple remedies there are that may be temporarily effective, as in the case of clogged strainers or obstructions in the suction-pipe. In such cases the overflow-valve should be closed and the steam blown back through the suction-pipe into the tank

This may clear the pipe, but the tank and the strainer should be cleaned as speedily as possible, as the tendency to accumulate impurities in the tank is very great.

A variety of influences combine to reduce the original efficiency of an injector. Those with fixed nozzles are constructed with orifices of a certain size and in proportion to each other.

When these orifices become enlarged by wear, the injector will not work well, and the only remedy is new tubes. Then, the tubes sometimes get loose inside the shell of the injector and drop down out of line. In examining the injector make sure the tubes are not loose

In regard to the incrustations or corrosion you mention. Much trouble is often avoided by the systematic cleaning of injectors, especially in districts where the feed-water is heavily charged with lime salts.

When cleaning the injector use a solution of one part muriatic acid to nine to twelve parts water, and allow the tubes to remain in the solution until the deposits are soft so they will wash out readily. A bath of benzin will accomplish the same results

NO JOB QUESTIONS.

D. F., Cleveland, Ohio.—We cannot answer questions such as you ask. Please read the heading to this department. Railroading is a pretty big game, and even though you are in it and want a change of atmosphere, you neglect to tell us whether you want to change from the presidency of one line to another or just change from shoveling coal in western Pennsylvania to handling oil-fuel in the Southwest; so, you see, we could not help you even if we would.

BUILDERS OF ELECTRICS.

J. G. B., Chester, West Virginia.—Electric locomotives are furnished by the following builders:

Westinghouse Electric and Manufacturing Company, Pittsburgh, Pennsylvania; General Electric Company, Schenectady, New York; Baldwin Locomotive Works, Philadelphia, Pennsylvania; American Locomotive Company, New York City; Orenstein-Arthur Koppel Company, Koppel, Pennsylvania.

ALASKA.

H. E. W., Northumberland, Pennsylvania.—No railroad runs from Seattle, Washington, to Seward, Alaska. It is an eight-day trip by boat between the two cities.

Seward is something of a railroad center, so to speak, since the government began construction of the Alaska Railroad. Suggest that you communicate with Mr. W. C. Edes, chairman, Alaska Railroad Commission, Seward, Alaska, who will more likely furnish you the particulars you wish than will some mining engineer, as you suggest.

ERIE LOCOMOTIVE.

O. E. S., Corregior, Philippine Islands.—We are quite certain that you are mistaken, for the Erie Railroad did not exhibit a locomotive at the Panama-Pacific Exposition. Glad to answer questions, so don't hesitate about asking what you want to know. In the present instance you are asking for information that is not true in fact, and, of course, we cannot be of service to you this time.

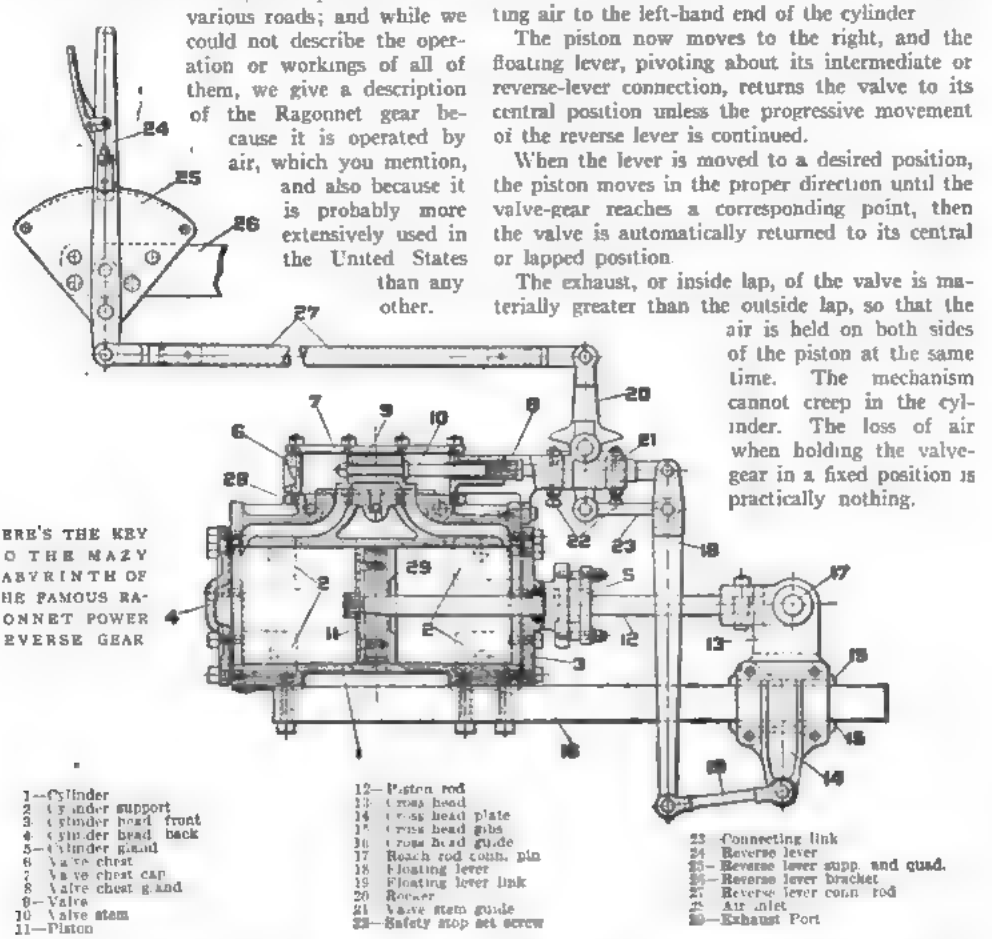
MARINE PUBLICATIONS.

R. H., Sault Ste. Marie, Michigan.—You might secure from the publishers a copy of the following papers that may prove of interest to

you—*Marine Engineering*, 461 Eighth Avenue; *Marine News*, 80 Broad Street; *Marine Review*, 90 West Street; all of New York City. We know of no publication similar to the RAILROAD MAN'S MAGAZINE, and devoted to marine or maritime interests.

POWER REVERSE GEARS.

J. C., Belton, Texas. We assume that you refer to power reversing-gears, of which there are a number of different designs in operation on the various roads; and while we could not describe the operation or workings of all of them, we give a description of the Ragonnet gear because it is operated by air, which you mention, and also because it is probably more extensively used in the United States than any other.



The gear is operated by air from the main reservoir, and its movement is controlled by a D-slide valve arranged for outside admission. The piston-rod of the reverse mechanism is connected to a cross-head, which is coupled to the reverse shaft by a reach-rod.

The cross-head arm is connected by a suitable link with the lower end of a floating lever. The upper end of this floating lever is pivotally connected to, and supported by, the valve stem, which in turn is carried by a cylindrical guide

Through the agency of a rocker, the upper end of which is connected by a light rod with a small reverse lever, and the lower end through a link with the floating lever, a short distance below the valve stem, the movement of the valve is controlled by the engineer in the cab.

The small reverse lever is locked in any desired position by an ordinary toothed quadrant. Assuming the lever to be in mid-position and the valve normally covering both parts: when the lever is moved into forward gear, the floating lever swings about its lower end of a fulcrum, and the slide valve is moved to the right, admitting air to the left-hand end of the cylinder

The piston now moves to the right, and the floating lever, pivoting about its intermediate or reverse-lever connection, returns the valve to its central position unless the progressive movement of the reverse lever is continued.

When the lever is moved to a desired position, the piston moves in the proper direction until the valve-gear reaches a corresponding point, then the valve is automatically returned to its central or lapped position.

The exhaust, or inside lap, of the valve is materially greater than the outside lap, so that the air is held on both sides of the piston at the same time. The mechanism cannot creep in the cylinder. The loss of air when holding the valve-gear in a fixed position is practically nothing.

With some power reversing-gears, the usual hand reverse lever is applied as an adjunct, but with the Ragonnet entire dependence is placed upon this mechanism for the work of reversing Hence it is necessary to have air-pressure upon the engine when the gear is to be moved.

In case of emergency, like the failure of an air-pump, provision is made for the operation of the gear by steam. . Since the introduction of the Mallet compound locomotives, with their heavy and complex valve motion, the development of power reverse-gears became an absolute necessity. They are now used on all kinds of new power,

and the man on the engine is relieved of much arduous labor.

STATION SERVICE.

L. P., Herkimer, New York.—Application for the position of station-agent, or for other positions in station service, should be made to the superintendent. Station-agents attend to the sale of tickets, the receiving and delivering and forwarding of freight, collections for the same, and see that cars are properly loaded and unloaded and forwarded; keep accounts, make reports and remittances.

In fact, the protection of the company's property and other interests is in his hands. At the larger stations he has charge of all employees, buildings, sidings, and grounds, at his station, and keeps the buildings and grounds in proper condition

The station-agents, who as a class have won the confidence and respect of their superior officers, are the railway companies' representatives with whom the shipping and traveling public come in contact, and much of the interest of the company is contingent upon what they do or fail to do

Of course, we could not begin to sum up here the multiplicity of things the railway station-agent and others engaged in station work are responsible for. Take the passenger station or building alone. This must be kept in the most perfect condition possible, as well as the grounds around it

The building must be kept in good repair, clean, neat, comfortable, and pleasant for travelers, for it all tends to promote the better interests of the company

When one considers the amount of things the agent must do, the exquisite orderliness and neatness which one sometimes sees at smaller stations is remarkable. The station at Ruxton, Maryland, on the line of the Pennsylvania Railroad shown in the accompanying illustration is an example of what can be accomplished in this direction.

OLD LOCOMOTIVE PICTURES.

J. B., Newport, Vermont. We know of no concern dealing in old historical locomotive photographs, especially of specified roads. However, the Locomotive Publishing Company, 3 Amen Corner, Paternoster Row, London, England, has a more complete list than any other that we know of, and while their list comprises mostly British and Continental European engines, they contain many American locomotives that may be of interest to you.

Pictures of the old locomotives of a road like the Central Vermont, that may still be in ex-

A STRIKING EXAMPLE OF WHAT CAN BE DONE IN THE WAY OF MAKING A SMALL RAILWAY STATION A PLACE OF BEAUTY AND ORDERLINESS IS FOUND ON THE PENNSYLVANIA RAILROAD AT RUXTON, MARYLAND

istence, are mostly in the hands of private collectors. Many of these are ready to trade or arrange exchanges, and as it is possible that some of our readers may have pictures of Central Vermont locomotives, we publish your name and address so that those interested may communicate with John Brown, Box 432, Newport, Vermont

LOCOMOTIVE HISTORIES.

2. About the only things that we can recommend to you in the shape of a book containing illustrations of early locomotives is Dr. Angus Sinclair's work, "The Development of the Locomotive Engine," which deals with early development and up to 1905, or J. Snowden Bell's on the "Early Motive Power of the Baltimore and Ohio Railroad." Both of these may be obtained from the Railroad Book Supply Company, 838 Columbus Avenue, New York City.

ROAD MAPS.

A. A. P., Santa Maria, California.—Road maps such as you describe may be obtained from Rand, McNally & Co., 42 East Twenty-Second Street, New York City. In communicating with the concern, be sure to specify exactly the districts in which you are interested

RAILROAD TIME-TABLES.

DR C. J., Washington, District of Columbia. There is no book published giving a compilation of the speeds of the fastest trains of America, Europe, or the world. The complete time-tables of the railroads of the United States, Canada, Mexico, and Cuba is given in the "Official Guide of the Railways," which can be obtained from the Railroad Book Supply Company, 838 Columbus Avenue, New York City. The book is issued monthly.

LOCOMOTIVE BOOKS.

2. Suggest that you secure a copy of the book catalogue of the concern referred to in our answer to J. B, Newport, Vermont, in this issue.

In regard to your other question, there is no train in the United States, or any other place in the world, the locomotive of which is exchanged while the train is in motion. We wonder who started that tale?

SUPERHEATERS.

R. W. C., Escanaba, Michigan.—In the Schmidt fire-tube superheater, the principal differences in the types "A," "B," and "C" is in modifications in the arrangement and location of the header castings. The type "A" is in most general use because of the following advantages:

The superheater units and header are in the top portion of the boiler and out of the way; the design and arrangement of the units are such that at the front end the least obstruction is presented to the free flow of the gases from the fire through the flues and smoke-box to the stack; the individual superheater units can be disconnected from the header by removing a single bolt, and the small flues in the lower portion of the boiler may be taken out without disturbing the superheater. The units are all of the same size, shape, *et cetera*.

The type "A" is therefore most popular because of its interchangeability and accessibility

The type "B" differs from the type "A" in that headers are provided for each cylinder, and located at the side of the smokebox instead of the top. In this design, in order to secure the best results it is often necessary to provide a cross-over pipe for the superheated steam between the two headers.

The type "C" is provided with what is known as a comb header, the saturated and superheated steam headers being completely separated from each other, each header having a main body extending transversely across the front end.

The upper, the saturated steam header, is connected to the dry-pipe in the usual way, and has subheaders extending downward. The superheated steam header is located with its main body down and the subheaders extending upward, and is provided with flanges connecting with the steam pipes. We will answer a few of your other questions in the next issue. Do not expect, however, that we can give the space necessary for the details you wish of the nineteen different locomotives you mention.

NEW HAVEN LOCOMOTIVES.

C. N. E., New Haven, Connecticut.—The New York, New Haven and Hartford Railroad locomotives Nos. 1300 to 1349 exert a tractive force of 37,558 pounds. Engines numbered 1350 to 1399, 40,800 pounds. The road numbers and the tractive effort of all the electric locomotives of this road are as follows:

Road Numbers.	No. of Engines.	TRACTIVE EFFORT Momentary.	Hourly.	Continuous
01 to 041	41	20 000	8,000	5,800
069	1	43,000	17,700	12,200
070	1	44,000	16,800	12,000
071	1	45,500	13,200	11,800
072	1	46,000	13,200	11,800
073 to 075	3	45,500	17,700	12,200
076 to 0111	36	40,700	17,700	12,200
0200	1	39,500	23,200	14,800
0201 to 0214	14	39,500	23,200	14,800
0215	1	38,750	23,200	14,900

CROSSING ALARMS.

H. L. V, Akron, Ohio.—The bells mounted on posts at highway crossings to announce the approach of trains are as a rule actuated by the train passing over a track circuit or track instrument situated at a suitable distance from the crossing.

The connection between the starting point and the relay is made by line-wires, and the instrument is set so that the bell circuit can be kept closed any predetermined time.

In the case of a track circuit, a section of the track 1,500 feet on either side of the crossing is bonded.

An interlocking relay with the pawl removed is used to control a local bell circuit.

A train entering the section short circuits the coils and drops an armature. These armatures carry contact springs that close the local bell circuit so that the bell will ring so long as the train remains within the ringing section

When the train passes out of the section, the armatures are picked up and the bell ceases to ring until the approach of the next train, when the operation is repeated.

INVENTIONS.

E. D. B., Phœnix, Arizona.—Glad to learn of your success as an inventor, and that the railroads and other users of power will not want to get along without the adoption of your devices. However, since you do not tell us the nature of your apparatus, what it is to be used for, and whether it is patented or not, we are unable to suggest what railway supply companies or others might be interested in your inventions.

USE OF TORPEDOES.

R. L. B., Los Angeles, California.—We are sorry that the space is not available for the publication of your long and interesting letter. Your observations, especially on the author of an article published ten years ago wherein he prophesied that by 1917 the standard gage would be six feet or more, were indeed interesting

He was sure dreaming dreams, like some others that are turned loose on subjects they know nothing about. His other observation on the railroad to Key West, Florida, and ferry to Havana, Cuba, has, of course, materialized.

The Florida East Coast now extends to Key West, where connection is made to the steamships of the Peninsular and Occidental Steamship Company for Havana. Steamers make the trip between the two points in 9 hours.

Under the code of rules of the American Railway Association, when a train stops under circumstances in which it may be overtaken by another train, the flagman must go back immediately with signals a sufficient distance to insure full protection, placing two torpedoes, and, when necessary, in addition lighted fusees.

When the signal is given, the flagman may return to his train, if safety permits. When conditions require, he will leave the torpedoes and a lighted fusee. The front of the train must be protected in the same way when necessary

EIGHT-HOUR LAW.

J. C. R., Haskell, New Jersey.—The Adamson Eight-Hour Law applies to every State and territory of the United States and the District of Columbia. It applies to all railroads except electric street railways, electric interurban lines, and independently owned and operated lines not exceeding 100 miles in length.

The exception in regard to roads less than 100 miles in length does not apply to those whose principal business is leasing or furnishing terminal or transfer facilities to other railroads, or who are themselves engaged in transfer of freight between railroads or railroads and industrial plants.

RAILROAD REGIMENTS.

L. M. S., Macon, Georgia.—As we understand it, there are more railway men already volunteered for service with the railroad regiments than they can use, at present, and we do not think that you could readily secure your transfer to one of them from your present location in the infantry

RAILWAY CLERK.

J. E. R., Baltimore, Maryland.—The *Railway Clerk* is issued monthly by the Brotherhood of Railway Clerks, 410 Kansas City Life Building, Kansas City, Missouri. The subscription price of the publication is one dollar per year.

Telegraphic & Telephonic

IF there is anything you want to know about the telegraph, telephone, or radio telegraphy—if you have an operating problem that puzzles you—if you want to discuss a question of theory—write the RAILROAD MAN'S MAGAZINE. We have engaged a technical expert who is one of the leading authorities of the country on these subjects. Ask him. He knows!

TELEPHONE MOTOR-GENERATORS.

L. V. J., Central City, Nebraska.—Small motor-generators are used in telephone central offices for various purposes. The motors are driven by any available commercial power, either d.c., or a.c., and the generator end of the machine may be arranged for low-frequency line-ringing current, for answer-back purposes, for busy

signal, or may have a direct current commutator for use in charging storage batteries.

These small, power-driven machines may be used to do the work of the ordinary magneto ringers

2. The mercury-arc rectifier, when used in telephone offices, may be used to transform current from commercial 110-volt alternating-current sources to direct-current at lower potentials for storage-battery charging purposes.

WHO TAUGHT EDISON?

S. G. G., Boyertown, Pennsylvania. Mr. Edison learned telegraphy in the year 1862, at Mount Clemens, Michigan, under the guidance of Mr. J. U. MacKenzie, station-agent. Mr. Edison's first railroad job was at Stratford Junction, Ontario, on the Grand Trunk, where he went to work in the year 1863.

LINEMAN'S POSITION.

J. L. D., Selma, Alabama.—For a position as telegraph or telephone maintainer on the lines of the L. and N. Ry., you might communicate with Mr. R. R. Hobbs, superintendent of telegraph, Louisville and Nashville Railway Company, Louisville, Kentucky.

ARMY SIGNAL SERVICE.

H. M. E., Sacramento, California. Under ordinary circumstances the examination for the grade of master signal electrician covers the following points:

1. Theoretical electricity and signal equipment, 100 units. (The voltaic cell, Ohm's law, primary and secondary batteries, telegraphy and the induction telegraph set, telephony, the camp telephone and the buzzer, cable and cable systems, small-arms target-range signaling systems, aerial line construction, post telephone systems, technical equipment issued by the signal corps and requisitions and general maintenance regulations, tests of submarine cables, *et cetera*.)

2. Drill regulations for field companies, 10 units.

3. Gasoline engines, 10 units.

4. Army regulations, 5 units. (Arrests and confinements, commands, honors, courtesies and ceremonies, courts martial, property accountability and disbursing, transportation, subsistence, *et cetera*.)

5. Algebra, not including quadratics, 10 units.

6. Regulations for United States military telegraph lines, 5 units.

7. Army signaling, 5 units. (American Morse code, Continental code, general service code, visual signaling by flag, torch, hand-lantern, or search-light, heliograph, ardois, stationary semaphore rockets, bombs, small-arms, guns, coston-lights, Very pistols, cipher messages, and improvised codes.)

8. Commercial radio regulations, 10 units.

9. Radio telegraphy, theoretical and practical, 30 units.

10. Telegraphy, sending and receiving, 10 units.

11. Visual signaling, sending and receiving, 5 units.

12. Record and recommendations, experience, 50 units.

Four days, working six hours each day, are required for the complete examination.

In the Signal Reserve Corps, a radio company is under command of three commissioned officers—a captain and two first lieutenants, all mounted. The non-commissioned officers and the enlisted men of the company include:

Master signal electrician. (Electrical expert and in charge of repairs and maintenance.)

Six first-class sergeants. (One assisting with clerical duties, the other five radio operators.)

Nine sergeants. (In charge of equipment, mess, stable, *et cetera*.)

Fifteen corporals. (Five of these corporals are operators; the others general aids.)

Thirty-five privates. First class.

All of these men, except the mess sergeant, two mechanics, and two wagon-drivers, are mounted. The arms carried are automatic pistols.

TELEGRAPHER'S CRAMP.

G. L. M., Philadelphia, Pennsylvania.—There have been many instances of hand-senders losing their grip, and recovering practically all of their former key-control by means of specially prescribed physical exercises. Recently a booklet has been issued on this subject, which contains suggestions for remedies. Copies may be obtained from Mr. R. D. Miles, Centralia, Washington.

FAST MORSE SENDING.

H. L. F., Cincinnati, Ohio.—Yes, the editor of this department will be glad to receive reports of any unusual performance of fast sending done by railroad or commercial operators. The information should give the number of words or number of telegrams handled in a specified time, and should state whether the telegrams were railroad or commercial.

In cases where there is likely to be a dispute about the authenticity or correctness of the reports, we shall do what we can to verify the figures. All statements received relative to speedy performance will be filed for use in any future account of fast sending which we decided to give publicity.

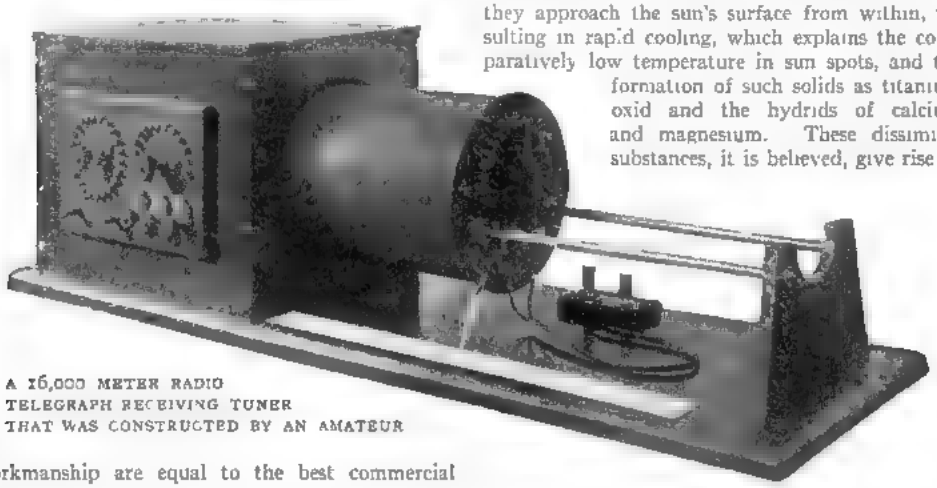
SOUNDER RESONATORS.

G. L. N., Atlanta, Georgia.—Resonators, used for mounting telegraph sounders close to the ear of receiving operators, were in use in England as early as the year 1890. The earliest appearance of the resonator in this country, so far as we can learn, was about 1892, samples having been brought from England by engineers of the Commercial Cable Company. The early reson-

ators were greatly improved upon by American telegraph engineers as soon as the employment of the device became general in this country

AMATEUR BUILT THIS.

JUDGING by the photograph of the 16,000-meter radio telegraph receiving tuner, which was constructed by an amateur, the design and workmanship are equal to the best commercial practise.



A 16,000 METER RADIO TELEGRAPH RECEIVING TUNER THAT WAS CONSTRUCTED BY AN AMATEUR

One of the inductance units consists of a coil of insulated wire wound upon a large bobbin, which may be moved into and out of the box which contains the hollow coil forming the other inductance unit.

The radial switches shown are used to cut-in as many turns of each coil as are necessary in any given instance to tune the receiver to radiation from distant stations. Size of base is 12 inches by 36 inches; height, 14 inches

AURORA BOREALIS.

ROBERT S., Thompson Falls, Montana — The phenomenon of the aurora borealis is a matter of considerable concern to telegraph and telephone wire-chiefs, owing to the occasional interruption of wire service due to electric currents from extraneous sources affecting circuits during the periods of aurora disturbances.

Benjamin Franklin, the first electrical scientist in America, had a theory to account for the aurora borealis, or northern lights, as the phenomenon was known at that time. Franklin's theory was that the aurora is due to electrical discharges in the upper air, in consequence of the differing electrical conditions between the cold air of the polar regions and the warmer streams of air and vapor raised from the level of the ocean in tropical regions by the heat of the sun

Of the more recent theories advanced, those of Professor Birkeland, of Norway, and Professor Arrhenius, of Sweden, are regarded as being based upon the most logical assumption

In the main, the theories of both these scientists point to the conclusion that electric corpuscles from the sun are attracted to the earth by the earth's magnetic poles, giving rise to vortices or whirlpools of electric current in the upper strata of the atmosphere surrounding the earth's surface

The connection between the simultaneous occurrence of sun spots and aurora disturbances is accounted for by the rapid expansion of gases as they approach the sun's surface from within, resulting in rapid cooling, which explains the comparatively low temperature in sun spots, and the formation of such solids as titanium oxid and the hydrids of calcium and magnesium. These dissimilar substances, it is believed, give rise to the magnetic field which is known to be a feature of sun spots.

There are many recorded occurrences of the interruption of wire service by auroral disturbances. On October 31, 1903, aurora borealis disturbances affected telegraph and telephone lines extending between Chicago and the eastern cities

On telegraph wires, without regular battery being applied at terminal offices, grounded lines showed a potential of 425 volts positive, varying to 225 volts negative, the disturbances continuing between 12 15 A.M. and 9 15 A.M.

It should be remembered that these disturbances are not confined to the north pole only. The same luminous effects when observed at the south pole are known as "Aurora Australis"

PHANTOPLEX AND PHONOPLEX.

GEORGE W. B., Omaha, Nebraska.—The phonoplex system of telegraphy was invented by Mr. Edison about thirty years ago, and when first introduced was placed in operation on a number of railroad lines as well as on a few commercial circuits.

On a telegraph-wire ordinarily worked as a single Morse circuit, the phonoplex system provided an additional circuit by means of a special coil of high inductance, electric condensers, Morse key, and a special sounder resembling a large telephone receiver. The superposed pulsatory Morse signals of the phonoplex operated the diaphragm receiver, but did not affect the regular Morse relays connected in the line

The phantoplex system of telegraphy is a somewhat more complicated system than the phonoplex, but it has been much more extensively employed, and in many instances is at the present time giving satisfactory service on American lines.

The phantoplex may be used to give one additional outlet over an ordinary single Morse circuit, or it may be superposed on lines worked duplex, permitting the transmission of two messages simultaneously in each direction over one wire—four messages at a time.

The phantoplex side of the circuit is operated by alternating currents, acting through transformers. The relays very closely resemble ordinary Morse relays, but are so designed that they will respond to weak alternating currents. The sending is done by ordinary keys, and the relays operate ordinary Morse sounders.

TELEGRAPH PICTURES.

THE editor of this department will be glad to receive for publication photographs of telegraph-office equipment. Photographs showing new installations of main-line switchboards, repeater-table equipment, composite telephone and telegraph apparatus, or selector cabinets are the most interesting. Only clear photographs will reproduce well enough for publication

In taking photographs, do not attempt to show much of the surroundings. A short description of the apparatus shown should be attached to each picture.

We are interested in learning how accurately wire-chiefs and operators can describe the purposes of each element of the electrical equipment with which they work.

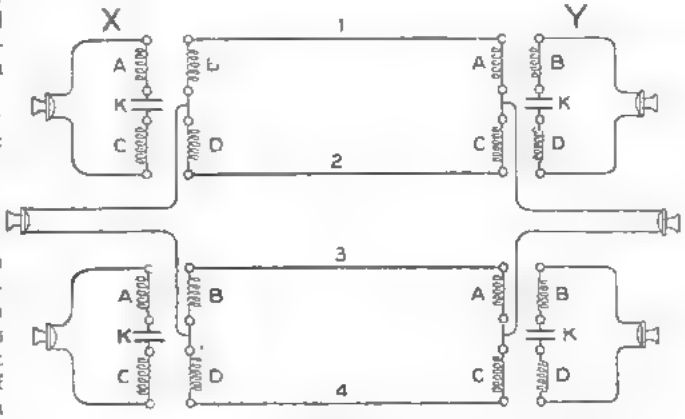
FANTOM TELEPHONE CIRCUIT.

THE diagram on this page shows the theoretical wiring of main line circuits of an arrangement whereby three telephone conversations are carried on over two pairs of wires.

The windings A, B, C, and D in each case constitute the repeating-coils through which the individual line-wires are accurately balanced electrically. K in each case is an electric condenser

It will be observed that the system consists of two metallic or physical circuits between stations X and Y, and also a fantom circuit; that is, an additional circuit requiring no additional line-wires between the two stations. The telephone transmitter illustrated in the center at each station is connected through a circuit each side of which consists of two wires already in use as a physical circuit.

When the individual line-wires are accurately balanced electrically the fantom circuit is a better talking circuit than either of the physical circuits.



BY MEANS OF THIS FANTOM TELEPHONE CIRCUIT THREE CONVERSATIONS CAN BE CARRIED ON OVER TWO PAIRS OF WIRES.

SPARKING OF KEY CONTACTS.

G. H. R., Lansing, Michigan.—Key contacts should be cleaned occasionally by means of finely cut steel files; one or two strokes over each point is sufficient. Sparking at points may be reduced by connecting around the key binding-posts a one half microfarad condenser.

RADIO ANTENNA.

G. S. C. Duluth, Minnesota.—A four-wire aerial one hundred feet in length is more efficient than a single horizontal wire four hundred feet in length. Increasing the number of wires increases the electrostatic capacity of the aerial, reduces the total inductance, and lessens the ohmic resistance of the aerial to high-frequency currents.

VOLT-METER, MILLIAMMETER.

EDWARD G., Denver, Colorado.—A milliammeter, or an am-meter, should never be connected between the line-wire and the ground connection. In using either of those instruments, it should be inserted in series with the line-wire in order to have the protection afforded by the resistance of the line and the instruments connected into it.

A volt meter, on the other hand, should not be connected in series with the line circuit, as the resistance of the volt meter is very high (20,000 ohms, or more), and readings thus obtained would have value only in particular tests. The volt-meter should be connected between the line-wire and the earth connection, or across the terminals of a battery or dynamo, in order to determine the value of the applied voltage

Keep in mind that the internal resistance of the am-meter and the milliammeters are very low, while the resistance of the volt-meter is very high.

If one cell of dry battery is connected to a voltmeter, the indicating needle of the meter will move only a few degrees; but if a dry cell in good condition is connected directly to a milliam-meter, the needle will be jammed all the way over, and bent; very likely the expensive meter will go up in smoke.

DUPLEX CAPACITY BALANCE.

L. L. H., Baltimore, Maryland.—In a telegraph circuit being operated duplex or quadruplex, the amount of capacity shown cut-in in the condenser at each end of the line after a static balance has been obtained is equal to about one-third the total electrostatic capacity of the line wire extending between the two offices; that is where the capacity is uniformly distributed throughout the length of the line.

WESTERN "OLD-TIMERS."

W. L. D., Dallas, Texas.—The Western Association of Old-Time Telegraphers was formed in April, 1906, with T. P. McKinney, of the Western Union, Spokane, Washington, as president, and A. W. Neimeyer, secretary of the association. We do not know whether or not the organization has been continuously maintained.

ANNIE ELLSWORTH.

GERALD W. B., New Haven, Connecticut.—Annie Ellsworth was the daughter of Commissioner of Patents Ellsworth, and to her was accorded the honor of sending the first message by Morse's telegraph. Miss Ellsworth had been the first person to announce to Professor Morse that Congress had finally appropriated a sum of $30,000 for a trial of his invention

The trial-line extended from a room in the Capitol in Washington to Baltimore, Maryland. The message was sent on May 24, 1844. Miss Ellsworth later married Roswell P. Smith

TELEGRAPH EXPERTS.

WILLIAM D. M., St. Louis, Missouri.—The engineers employed by the telegraph and telephone companies are more concerned with details of construction and operation of lines and equipment, than with matters of a purely scientific nature.

Of course, a certain amount of research work is carried on in the New York laboratories of both telegraph and telephone companies; but new development work and problems of design are carried on more extensively in the laboratories of the manufacturing companies

At the present time the Western Electric Company is looking for engineers and designers and draftsmen for work of research, development, and design related to problems of telephonic, telegraphic, and radio communication.

If more operators had taken the advice of the editor of this department, say, a year ago, to take up in earnest the study of the technical features of telegraphy, many of these men could to-day step into these desirable positions.

It is not too late now, and we would like nothing better than to see good old (or young) brass-pounders who have a leaning toward mechanical and electrical work make use of their unsurpassed opportunities in telegraph-offices to become successful engineers.

Any who know they are now qualified for laboratory work might communicate with Mr F. B. Jewett, chief engineer, Western Electric Company, 463 West Street, New York City.

OPERATORS WHO DRINK.

A. Z., Memphis, Tennessee writes: Will you please answer this question through the columns of your magazine, and oblige? I used to work for a telegraph company as messenger, and noticed that nine out of ten operators drink, and also heard several times that any one could not be a first-class operator unless he drank, on account of it being such nervous work.

I do not believe this to be true, as there are a great many women operators, and good ones at that, and I don't think that they drink. If you will please answer this, and also state what is good for the nerves instead of booze—that is, if anything at all is needed for them—to be a first-class bonus operator without being a nervous wreck all the time, I will appreciate it very much.

A. Z.'s inquiry is one we are glad to have an opportunity to answer.

It may be true that in some localities, or in particular offices, many years ago, too many telegraphers indulged in intoxicating liquor; but that day has unquestionably passed away.

At the present time in any well-regulated commercial telegraph-office, or in railroad terminal offices where a number of operators are employed, drinking is not tolerated. In fact, both commercial companies and all railroads have a positive rule against drinking on duty, and against coming on duty while in any degree under the influence of liquor

In the old days, when the rules were not so strict or so rigidly enforced as at present, some operators have been known to do good work while tipsy; but if you will carefully study the article in the August number of this magazine entitled "America's Champion Telegraphers," you will find that those who are to-day recognized as the fastest senders and receivers in the world are men who either do not use liquor at any time, or at least certainly are men who do not use it to an extent that interferes with maintaining a clear brain and a steady hand

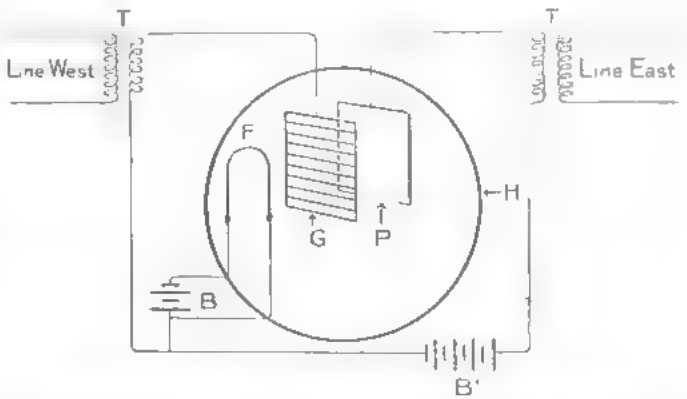
WONDROUS PHONE REPEATER.

TELEPHONING between cities more than a thousand miles apart was made possible when it was discovered that Dr. Lee De Forest's wonderful audion (used in radio signaling) pos-

sessed properties which make the device an amplifier of feeble electric impulses

The accompanying diagram shows the theoretical circuit arrangements of the telephone repeater as used on the transcontinental telephone-line across the United States

"H" is a glass bulb about the size of an ordinary incandescent lamp, from which the air has been exhausted "F" is a light filament brought to incandescence by current from battery, "B." "G" is a metallic grid, and "P" a metallic plate "T" and "T'" are small transformer coils inductively joining the two sections of line connected through the repeater



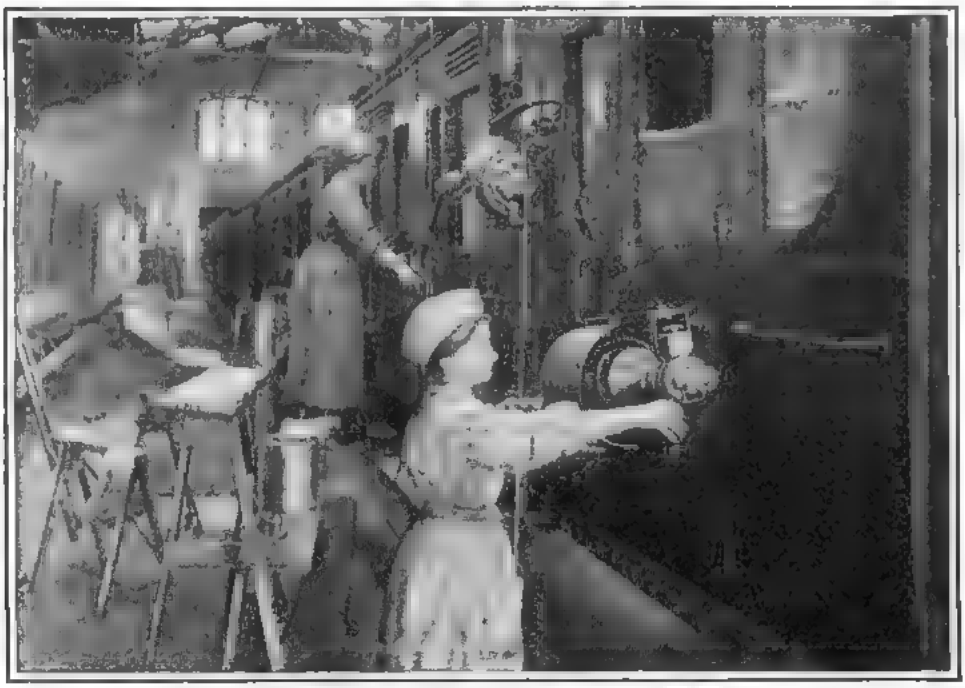
DR. LEE DE FOREST'S WONDERFUL AUDION WHICH MADE POSSIBLE TELEPHONING BETWEEN CITIES MORE THAN A THOUSAND MILES APART

When filament "F" is red hot, millions of corpuscles, or electrons, each carrying a minute charge of negative electricty leave the filament, at high velocity and in a continuous stream.

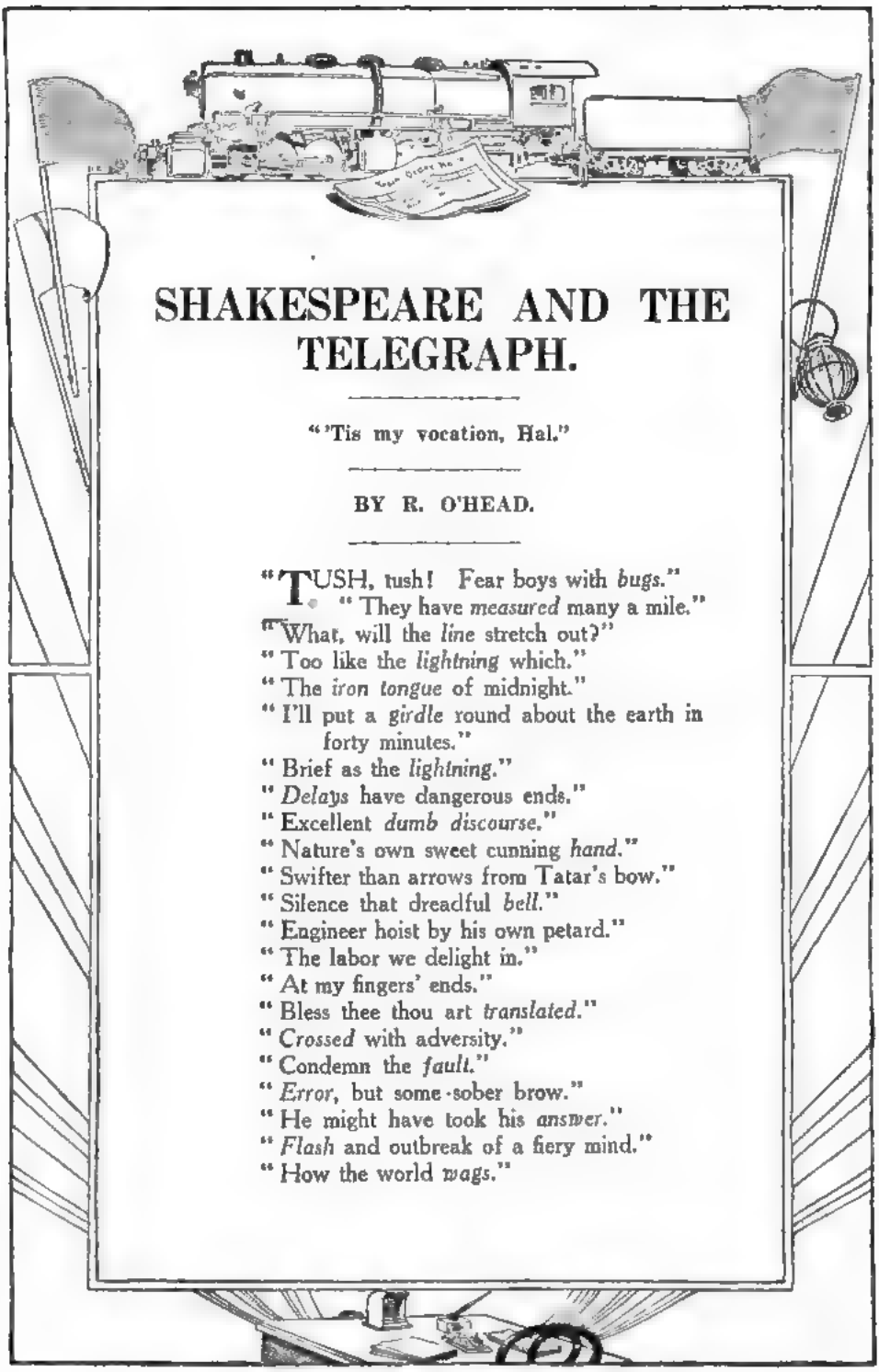
The purpose of the grid is to act as a sort of gate or valve, permitting a greater or less number of the electrons from the filament to reach the plate "P."

The effect of the incoming impulses from the line through transformer "T" is to raise and lower, in accordance with the line currents, the negative potential of the grid, thereby controlling the flow of electrons from filament to plate Thus the line impulses (voice currents are passed into the transformer coil "T'" of the adjoining line with renewed energy sufficient to carry them to the distant terminal station or to the next repeater station.

CAR-CLEANING MADE EASY IN FRANCE.



THE JOB OF CLEANING COACHES HAS BEEN MADE MERE PLAY IN FRANCE, WHERE A NEW MECHANICAL BRUSH IS IN COMMON USE IN MOST BACK SHOPS



SHAKESPEARE AND THE TELEGRAPH.

"'Tis my vocation, Hal."

BY R. O'HEAD.

"TUSH, tush! Fear boys with *bugs*."
"They have *measured* many a mile."
"What, will the *line* stretch out?"
"Too like the *lightning* which."
"The *iron tongue* of midnight."
"I'll put a *girdle* round about the earth in forty minutes."
"Brief as the *lightning*."
"*Delays* have dangerous ends."
"Excellent *dumb discourse*."
"Nature's own sweet cunning *hand*."
"Swifter than arrows from Tatar's bow."
"Silence that dreadful *bell*."
"Engineer hoist by his own petard."
"The labor we delight in."
"At my fingers' ends."
"Bless thee thou art *translated*."
"*Crossed* with adversity."
"Condemn the *fault*."
"*Error*, but some sober brow."
"He might have took his *answer*."
"*Flash* and outbreak of a fiery mind."
"How the world *wags*."

"PEP," THE CIRCUS PRESS-AGENT.

BY WILLIAM H. SEYMOUR.

He Planted Some Fine Stories in the Rap-Sheets, But Finally Got Too Fly for His Own Good.

TH' village clocks is strikin' nine bells when the circus train pulls inta Hix Center one We'nesday mornin'. It takes us eight hours ta make a thirty-mile jump from th' last burg because they was a coupla wash-outs along th' pike. I can't call them two rusty ribbons a railroad an' hold my rep fer stickin' ta th' truth.

By th' time th' cars is parked on th' stub-end sidin', th' boys is so hungry that they was ready ta chew th' paint off th' band wagon. Most of us ain't tucked any scoffs under our belts since th' cook yelled "heads up" at supper time th' night before. They was a few sangwitches in th' priv'lege car, but they didn't last as long as lobster salad on a free lunch bar.

Me an' my pardner is th' first ta do a Brodie off th' priv'lege car steps.

"Slim," he cracks ta me, "it's goin' ta take them cook-house flunkies 'bout an hour ta frame their joint; let's you an' me hit th' cinders fer th' village scoff joint an' wrap ourselves around some eats in a hurry."

"Bright idear, Red," I tells him. "I'd never thought of that myself. Ya've got a won'erful bean."

He's hep that I'm kiddin', but he's so hungry that he don't come back at me. We "counts 'em" down th' track like a coupla hamfats that's been dumped in th' sticks. In about ten minites we casts our glims on th' station an' a scoff cart beside it.

"Guess that'll be about our speed," Red tells me as he gives th' cart th' double O.

"I'll try anythin' once," I says an' we breeze inta th' joint.

They is a bunch of village cut-ups warmin' th' stools and peddlin' out bum comedy. Th' stew-tosser behind th' counter is th' rankest of th' push. Seems like he's th' prize dancer, th' prize fighter an' th' champean comedian of th' burg. Him an' his townies is chuckin' out a bunch of cheese jokes what they've grabbed outa a sasperilla almanick stuff that Noah used ta get away with on th' ark. Sittin' next ta me an' Red is a quiet, red headed guy that don't open his face except when he hoists a forkful of Bostons. I gives him a quick slant an' wonder if he's th' only hep guy in th' mob or whether he's jest deef an' dumb. After a wile this quiet guy turns ta me an' says:

"What da ya think of these tank-town comedians?"

"Dead from th' neck up," I tells him.

"You told it right th' first time," he says. "The' poor yaps have got themselves kidded up so's they think they're puttin' acrosst some clever stuff an' th' Broadway push is a buncha bums."

I'm tryin' ta figure what this guy's graft is. It's a cinch he ain't a native because he speaks as good English as I do myself. Th' quiet guy has his face sunk in a mug of Java an' when he comes up he starts ta bawl th' yap soup-squirter about th' bum coffee.

"Wise me, bo," he cracks ta th' waiter, "how da ya manage ta give this warm water such a rich golden brown color without usin' any coffee?"

Th' corn-fed cut-up tries ta think of th' proper come-back fer a crack like this but I guess they wasn't anythin' in his sasperilla joke-book that seemed ta fit.

"Da ya make it outa old harness?" says th' quiet guy. "Or is it old rubber boots with a fistful of tabacco stems ta give it color? I'll bet th' circus cookee wouldn't have th' courage ta peddle out this slum an' call it Java. Would he, boys?" he asts Red an' me.

"Not wile we're conscious!" I tells him.

Th' yaps tie th' tinware ta their funny stuff wile th' quiet guy soft pedals his chatter ta me an' Red.

"I used ta troup with th' white tops myself," he tells us. "My name is Pepper—Red Pepper."

"That's a hot one," I cracks before I thinks.

"I'll forgive ya this time," says th' Pepper person. "Call me Pep fer short. They is always two or three Reds in every aggregation. I s'pose yere side-track answers ta that monicker?"

"Ya hit th' nail on th' nose that time," says Red.

"Mine is Slim," I says. "An' ya use ta troup?" I asts him.

"You said it," this Pep guy tells me.

"Wild West?" I asts him next because I ain't strong fer Wild West guys unless they're th' real goods. Most of them is phonies that has ta doll up in cowboy scenery even if they're only drivin' stakes or waterin' a horse.

"No," says Pep, "not Wild West but I've been with outfits that had a bunch a' wild guys, specially on pay-day. Pay-day was fight-day. I've trouped with railroad shows an' one-ring wagon shows. Pull yere boots off between th' wagon spokes an' flop under a tarp'lin. Soup an' stew grub when it wasn't fast day. I know th' dope backwards. What's your graft, boys?"

"Juice joint," I tells him. "Me an' Red cuts it fifty-fifty."

"Well, so long, boys," he tells us, "I'll give your joint a play if I go ta th' show."

"Better come," I says, "we'll use ya like a duke."

"Well," says Pep with a smile, "I know that you boys would use me okay but th' Old Man is liable ta pull a gat on me."

Before I can ast him what he means, Pep oozes out an' leaves me guessin'. Red an' I mulls it over wile we're moppin' up our stack of pale ones, when we fergets it an' drills fer th' circus grounds.

Breakfast is jest startin' an' we crashes ourselves on th' scoffs because it don't cost nothin'. Th' Old Man is at th' head of th' table givin' th' local newspaper a quick slant. All of a sudden he lamps somethin' that makes him laff like they was a foolish powder in his Java.

"Listen ta th' send-off th' village rapsheet gives us," he says ta th' bunch as he starts ta read out loud:

"——WARNING ——

Take in your wash lines. Lock the hen house. Bury the family jewels in the cellar.

THE ARMOR PLATE SHOW

is in town.

Two shows daily—Afternoon and Evening.

August 2, 3, and 4.

Three days.

(If the Mayor don't call out the Militia.)"

When th' Old Man stopped readin', th' bunch was laffin' their heads off like it was a new Ford joke. Th' bearded lady spills a coupla soft-boiled eggs in her whiskers wile she fills th' summer breeze with peals of girlish lafter. Th' Human Ostrich gets so full of mirth that he swallows a fork, but th' Old Man was keepin' cases on th' Ostrich an' fines him a case note fer coppin' th' silverware. Th' freak promptly utters a squawk.

"Nix on th' argument," says th' Old Man. "I saw ya go South with that fork an' it don't make no difference ta me whether ya swallowed it or jest copped it; I'm shy a fork anyways ya look at it. Don't ferget that."

At first I thinks that th' Old Man is sore about what he read in th' rapsheet an' that was why he taxed th' Human Curiosity, but I was wrong because th' Old Man says ta th' bunch:

"Every knock is a boost an' when it's in print it's th' best kind of advertisin'. I'm hep ta this editor, our advance agent tipped me off. Th' advance tries ta place

an advertisin' contract with this rapsheet but th' editor used ta be an advance agent himself. He's a hep guy an' wants all th' dough in his mitt before he does bus'ness. Our man can't see it that way. Th' editor gives us this free notice fer tryin' ta put one over on him. I got ta give him credit; his name is Pepper an' he's full of it."

Right away I can see what Pep means by that crack about th' Old Man pullin' a gat. But th' whole outfit thinks it's a swell joke. They're all laffin' except th' Ostrich an' he's peeved about that one buck fine.

Some guys swamp their sorrows in tonsil varnish but th' Ostrich was built different. When he got sore he had a habit of eatin' nails an' spittin' rust. That kinda fodder will make a canary bird start a rumble with a tom-cat. Anyways th' Ostrich goes lookin' fer th' Old Man that afternoon an' finds him alone in th' dressin'-room office. They has a battle about th' fine an' th' Ostrich hangs a blue door-knob on the Old Man's lamp. Then th' freak beats it fast before th' Old Man's strong-arm squad can come ta th' rescue.

Th' strong-arm bunch rake th' village fer th' Ostrich but he's gone, as th' poet says, "like th' free lunch of yester-year."

We don't talk about th' Old Man gettin' a blue one unless we talks in whispers. Th' Gov'ner has a bad temper an' he's jest as liable as not ta wrap a wagon spoke 'round yere neck if he heard ya kiddin' about him.

Next mornin', th' bunch thinks that th' editor of th' village rapsheet is jest about due ta attend a funeral with six of th' townies walkin' slow beside him. When th' Old Man blows in fer breakfast everythin' is quiet jest like when th' guy in th' white coat says, "Who's payin' fer this?"

Th' Gov'ner takes a peek at th' rapsheet an' gets an eyeful of Pep's funny stuff. Ya couldn't miss it. It's a double colyum head in bold face type on th' front page:

"HUMAN OSTRICH" GAVE HIM A SHINER.

Circus Owner Beaten in Fist Fight with Side-Show Freak.

Then Pep followed it up with some real funny dope on th' battle. As th' Old Man glims it over he looks sore like as though some yegg had twisted th' strong box fer th' day's receipts.

Then he lamps th' headin' over again an' his map loosens inta a smile an' from a smile th' Gov'ner busts inta a haw haw.

"S'pose you've seen this?" he asts th' bunch.

We says we did.

"Well," says th' Gov'ner, "that Pepper guy is clever. I oughta bust him in th' nose fer this an' then fill him full of little round holes about thirty-eight caliber. But I got ta hand it ta this guy fer gettin' th' news an' gettin' it over with pep an' a punch. It's a cinch that he ain't leary about gettin' himself inta th' death colyum in his own rapsheet. Why, I blame near croaked an editor down in Texas fer less than that."

Then th' Old Man starts ta peddle out some ancient history that we all knows by heart, we've heard it so often. It was about a battle with a one-armed Mex. Th' Old Man ties one mitt behind him ta make things even an' then him an' th' Mex is locked in a dark cellar. Each has a Bowie in his mitt an' a yen fer murder in his heart. Th' dicks crimped th' finish when they busts in th' door half an hour later an' pinched th' battlers. Th' Old Man never misses a chance ta give us an earful of this bug-house duel.

After he uncoils this battle yarn gets it off his chest so he can breathe freely once more—I tell th' Old Man just how I meets up with Pep in th' scoff cart.

"Pep," says th' Gov'ner, "is okay, if ya sees him again tell him I want ta look him over."

That afternoon Pep pulls up in front of th' juice joint. We're only beefin' together a little wile when he says he has a yen ta join out with th' aggregation.

"Ya know th' old sayin', Slim," he tells me, "is, 'once a trouper always a trouper.'"

Seems he got dumped in that burg when his show blew up th' first of th' season. He's a printer an' grabbed out a job on th' village rapsheet. Pretty soon they slips him th' editor's job at twelve seeds per week.

"Seeds," says Pep with a laff, "comes pretty close ta th' truth. Too close ta suit yours truly became these yaps is liable ta pay ya in pertaters or turnips. I might have stuck it out if I hadn't of heard th' calliope callin' me."

I tells Pep what th' Old Man said about th' stuff in th' paper; then I steers him inta th' dressin'-room office an' leaves him. When Pep comes out he tells me that he's th' "publicity manager" of th' outfit.

We're only on th' road a few days when Pep pulls his first stunt. It's a newspaper story about one of th' trained elephants breakin' loose. Th' bull is supposed ta have been ramblin' 'round th' burg at daybreak. He sees th' City Hall an' thinks it's an East Indian temple an' he gives it th' once-over. Under th' back steps he lamps a lawn mower. Now in his country th' elephants are trained ta mow th' lawns in front of the temples so th' bull gets busy with th' lawn mower an' clips th' green stuff in front of City Hall.

Jest how Pep framed th' act I don't know, but th' elephant sure did run th' mower over th' grass at City Hall because Pep had it framed so that th' towners caught the bull in th' act. Th' rest of th' yarn was plain bunk, but nearly every rapsheet in th' county fell fer it an' spread th' story over a coupla colyums on th' front page. All this advertisin' didn't set th' Old Man back a cent an' it was worth hundreds of iron men if he'd of had ta send in th' dough fer it.

When th' elephant stuff goes stale Pep has another line of bunk ready fer th' rapsheets ta gobble up. This one was about a lady chimpanzee elopin' with a big Rhesus monk. Th' Old Man did turn loose a couple of monks but th' bunch gathered in th' "elopin' couple" th' next day. Th' yaps came out of th' thicket fer miles around ta get a peek at th' monkey sweethearts. Pep grabbed this idea from th' advance copy of one of them monkey love songs but he bulled th' natives inta thinkin' that one of th' New York song writers was stealin' his stuff.

Pep digs up a bran' new scheme when we was playin' th' burgs along th' lake front. About a week before we hits th' first burg, th' natives begins ta find sealed bottles washed up on th' shore. When th' bottles is busted open, th' yaps find a piece of paper inside that's covered with a bunch of mixed-up letters what looks like they was written in blood.

After a wile th' other burgs down th' shore begins ta find th' same kinda bottles.

Th' rapsheets fall heavy. They reproduce th' "mysterious message" an' get th' natives all steamed about what th' writin' means. Every one is tryin' ta dope it out. Th' janes ferget ta powder their beaks an' they leave th' grub burn wile they're cookin'; an' th' men is lettin' th' beer go flat wile they takes a whirl at th' message.

High-brow doctors, lawyers an' schoolteachers all take a crack at th' game jest ta show what wise geeks they are an' what boobs th' rest of their townies is.

When a yap does uncoil th' right answer, he beats fer th' village rapsheet ta have it printed an' grab off a bunch of glory fer himself fer bein' such a clever gink. Of course it was a notice about th' circus but th' editor can't say "Nix" ta th' clever yap that doped it out, because th' yap is prob'ly some big mug in th' burg. He's liable ta put th' rapsheet on th' blink if he don't get credick fer his clever work. It isn't long before half th' yaps in th' burg an' half th' papers in th' county are battlin' among themselves about which was first ta shoot th' right answer acrosst.

This bottle stunt was good fer pages of readin' notices an' it pulls like a poultice. We was packin' th' yaps ta th' ring bank at every show. Th' only trouble was we can't play th' lake shore all season.

But this don't worry Pep a little bit because he's been promotin' another thriller ta make th' natives sit up an' blink their glims. It's an old one but th' yaps went after it a mile a minute.

I don't know how he worked it but Pep frames a weddin' between th' Snake Charmer an' th' Cigarette Fiend. Th' rapsheets print th' pitchers an' th' past performances of th' freaks. Pep invites th' whole county ta come ta th' show an' see that th' weddin' is pulled off okay. It's goin' ta be staged in th' big top jest before

th' night performance an' Pep tells th' yaps ta buy their tickets in advance.

Th' natives tumble outa th' sticks in droves. They'd all polished up in their Sunday rags like they was first cousins ta th' bride an' groom. Style? Say, Fifth Avenue was an alley—if ya could believe what th' society reporters on them village rapsheets told ya

I never got hep ta how Pep fixed th' next weddin' that come off a little later. Sometimes I think that he must 've tipped th' Bearded Lady that th' Three-legged Man had a sock full of di'monds an' at th' same time Pep must 've told the three-legged guy that th' whiskered beauty had a trunk full of radium. That's th' only way I can dope it. But whatever he told them they fell fer each other.

Th' next pair ta go against th' marriage stuff is th' Armless Wonder an' th' Mitt Reader. Th' little palm-reader wasn't a bad lookin' jane a tall, if she was only a blondy I might have dropped fer her myself.

Pep is framin' th' Fat Lady an' th' Tattooed Man ta be th' next coupla suckers when th' weddin' game gets a swift clout in th' slats.

It happens like this: When Pep blows inta th' cook-house one mornin' at breakfast time, he finds th' Snake Charmer an' th' Cig Fiend battlin' away like a coupla cats that ain't been properly introduced. They jumps on Pep an' tells him he's got ta come acrosst with a divorce seein' as how he got them married. Ta hear them two freaks rave, ya'd think that ya can get divorces with a book of tradin' stamps or somethin' like that.

"What seems ta be th' squawk?" asks Pep.

"He smokes cigarettes in bed!" howls th' Snake Charmer. "He's near burnt me ta death a dozen times since we've been married."

"An' she," squawks th' Cig Fiend, "has a pet snake an' she brings him ta bed with her! Can ya pitcher yereself wakin' outa peaceful sleep an' gettin' an eyeful of that worm roostin' in th' center of yere chest?"

"I can't pitcher it a tall!" says Pep. "They ain't nothin' in *my* book like that."

"When I wakes up sudden like that," says th' fiend, "I think I'm seein' things an' I dives outa th' berth before I knows where I am. We're in th' top of a three-decker an' I'm black, blue an' green from divin' onta th' floor. What we wants is a divorce an' we wants it quick. See?"

Pep smoothes them down but in a coupla days he's got a fresh squawk ta square. This time it's between th' three-legged guy an' th' bearded jane.

"Ya got ta get us outa this marriage thing!" yells Three Legs ta Pep.

"Ca'm yereself, my friend," says Pep. "What's th' row?"

"Row!" roars th' freak. "She's got a beard like barbed wire! She busts my combs an' fills my brushes full of soft-boiled eggs an' veg'tables! Worse than that—she drags that hedge acrosst my map an' calls me 'dearie!'"

Th' bearded queen begins ta tell secrets.

"He's got cold feet," she squawks. 'They're like ice. An' don't ferget, he's got *three* of 'em!"

Of course them wasn't th' only things they didn't like about each other an' Pep is a busy guy fer half an hour smoothin' them down. He ain't through with that pair no more than ten minutes before th' Cig Fiend an' the Snake Charmer breaks out again an' gives him a lugful of their troubles.

For th' next week them four freaks is battlin' with each other an' battlin' with Pep. Sometimes they comes one at a time, sometimes it's a pair of them, other times it's th' whole four in a bunch. Pep ain't got no time fer th' publicity graft; he's too busy pryin' the lovin' couples apart.

But th' blow-off comes when th' Armless Wonder an' th' Mitt Reader joins th' ranks of th' battlers.

How I'm one of th' first ta be let in on it, is like this: Pep is standin' in front of th' juice joint givin' me an earful about th' other four freaks. Up blows th' armless guy with bleed in his glim.

"Ya got ta help me ditch that jane," he growls ta Pep. "Ya got me inta th' toils; now git me out."

"What's *your* chief trouble?" Pep asts him.

"That jane," th' wonder says, "is daffy about tellin' fortunes. All th' time, she's tryin' ta tell mine; th' soles of me feet are ticklish an' she near has me laffed ta death."

"Keep yere shoes on, pal," Pep tells him. "Go back an' take another whirl at married life."

"Not a chance!" says th' freak. "She won't learn ta roll th' makin's fer me unless I learns ta hook her clothes up th' back. It can't be did."

I don't wait ta hear what else th' wonder has ta turn over ta Pep—I couldn't—I has ta duck out behind th' juice joint an' take a big laff fer myself. It seems ta me that none of them freaks has much ta squawk about except th' guy that's hooked up with th' bearded queen. But then, freaks is freaks an' I should bust out cryin' whether they stays married or not

Next time I sees Pep he cracks ta me:

"Slim, I got six of 'em ta battle with now an' I has my mitts full ta keep them from chewin' each other's necks. Somethin' has got ta bust soon, even if it's th' show. They is only a few more weeks before th' band plays 'Home, Sweet Home' but this buncha nuts will have me worried thin as a dime by that time. I'd blow th' show only I feels as though it's my fault they're hooked up with each other."

"Why don't ya ship th' whole blame six of 'em ta Reno?" I asts him. I was only kiddin' but Pep seems ta take it serious because he thinks fer a wile before he speaks.

"Only three of 'em need go," he says like he was talkin' ta himself.

Then he says ta me, "Th' rattler fare hadn't ought ta be over a five-spot from here. Thanks fer the tip, Slim, I'll look it up."

Pep must 've worked fast because when th' bunch was in th' priv'lege car that night, th' west-bound express whizzes past with three janes on the back platform an' they was wavin' handkerchiefs ta th' circus crowd. One of them janes has whiskers.

When I asts Pep about it he tells me that th' janes has blew th' show an' is goin' ta take a whirl at th' divorce mill.

"Th' Old Man will be one sore guy when he gets hep," Pep tells me.

"Yes, it'll crimp th' side-show," I says.

"Well," says Pep, "I've run side-shows with ten banners in front of 'em an' a goat, a monk, an' a Punch-an'-Judy inside of 'em."

Pep squares himself with th' Old Man all right an' sticks with th' outfit till th' show closes.

Th' last time I sees Pep he has a scheme ta learn a flock of parrots ta fly 'round in th' tank towns an' talk ta th' yaps about th' show.

Some boy that Pep.

IN MEMORIAM.

BY CLIFFORD LEVIN.

THEIR meeting it was sudden,
Their parting it was sad;
She gave her young life meekly—
'Twas the only life she had.

She's sleeping 'neath the willows,
And she's resting peaceful now,
For that's what always happens
When a freight-train meets a cow.

HITTING THE BALL FOR UNCLE SAM.

THE indispensable part which the railroads of the United States are playing in the prosecution of the war, our participation in the war, as well as some idea of the steam-carrier's remarkable growth in efficiency within the last couple of years, are shown graphically by R. H. Aishton in an address which he recently made before the St. Louis Railway Club. As the president of the Chicago and North Western and chairman of the Central Department Subcommittee of the Railroads' War Board, Mr. Aishton's utterances may be accepted as authoritative. Mr. Aishton said in part:

Extremely few people have any conception of the magnitude of the problem with which the railway managements have been confronted by the enormous increases in traffic within the last two years. If more people understood this, there would be less criticism because there have been shortages of cars, and more appreciation of the remarkable increases in railway efficiency which have been made, and which have had to be made in order to prevent the congestions and car shortages from becoming very much more serious. Let me give an illustration of the most striking kind regarding both the increase in freight traffic and the increase in the efficiency of operation which have had to be made in order to handle this increased traffic.

52 Per Cent Increase Since 1915.

Our railways have only a very small number more miles of line, track, locomotives, and cars than they had in the fiscal year which ended on June 30, 1915, two years ago. In the calendar year 1916, however, before the present organization for operating the railways as a single system was formed, they handled thirty-one per cent more ton miles of freight traffic, according to the best estimate that can be made, than they did in the fiscal year ending June 30, 1915; and at the present rate of increase it appears probable that in the calendar year 1917, they will handle at least fifteen per cent more ton miles of freight than they did in the calendar year 1916. This will make an increase in the freight traffic handled in the calendar year 1917, as compared with the fiscal year ending June 30, 1915, of 141,000,000,000 ton miles, or fifty-two per cent. Stated thus baldly in statistics, this increase may not appear to you as very significant, but I will state it in terms which will make it more significant.

If, during the rest of the calendar year 1917 the railways of the United States handle a traffic relatively as much larger than that of the fiscal year ended on June 30, 1915, as that which they have thus far handled during the current year, the increase in freight traffic handled by them over that handled by them in the fiscal year 1915 will be greater than the total freight traffic moved annually before the war by the combined railways of Germany, France, Russia, Spain, Sweden, Switzerland, Rumania, Holland, Canada, South Africa, Mexico, Japan, Brazil, and New South Wales. In other words, the railways of the fourteen countries I have mentioned handled before the war a total of 141,000,000,000 ton miles of freight a year, while in the year 1917 the increase in the freight traffic of our railways alone over that of the fiscal year 1915, will be about 141,000,000,000 ton miles.

These figures give some idea of how much more vast is the railway system of the United States than that of any other country, as well as of the increase in freight traffic which has occurred within the last two years, and of the increase in the efficiency of the operation of the railways in this country; for as I have observed heretofore, this tremendous increase in traffic is being handled with a relatively small increase in facilities.

Stated in tons instead of ton miles, the increase in traffic in the calendar year 1917 over the fiscal year 1915 probably will be close to 510,000,000 tons. On the basis of the number of tons now being handled per train, it would take 720,000 trains, containing 18,000,000 cars, to hold this increase in tonnage. If all of these cars were made up into a single train it would be 136,363 miles in length.

Is it any wonder, in view of such facts, that there have been, and probably will continue to be, some congestions and delays?

There are some people who use the evidence of recent increases in railway efficiency as a basis for criticising our railways. They say that such figures show that the railways were inefficiently operated before, and that a corresponding increase in efficiency ought to have been accomplished before we entered the war Those who are really familiar with railway affairs in this country know how utterly without foundation such criticisms are. In the first place, it is easy to demonstrate that the railways have been steadily increasing the efficiency of their operations. If they had not been, the advancing wages, prices, and taxes to which they have been subjected, together with the kind of regulation of rates which they have had to bear, would long since have bankrupted most of them.

In the second place, they never had such an opportunity to increase the efficiency with which they use their facilities as they have had since this country entered the war. They have been allowed since then, to operate, in so far as they have found it expedient, as a single system, while before we entered the war, the railways were prevented from doing this by the Sherman law.

They have also been able, since we entered the war, to secure an amount of effective cooperation from all shippers, large and small, in the country, that they never were able to obtain before; and in this same connection, the helpful and cooperative efforts of a number of the public service commissions in the various States, which early realized the situation confronting the railways and the necessity for increasing their efficiency, and which have used tremendous influence with the shippers and the public to bring about the elimination of delays to equipment; proper loading of equipment; and all of the various things of that kind that tend to increase the railways' efficiency; and by the weight of their influence they have been most helpful to us.

A MAIMED OPR WHO CAN'T BE FEEZED.

MELVILLE FISHER, ALTHOUGH CRIPPLED FROM THE AGE OF FIVE, HAS BECOME AN EXPERT TELEGRAPHER AND HAS RECEIVED AS MANY AS NINETY-EIGHT MESSAGES IN AN HOUR

NEW CHANCE FOR OLD HEADS.

Former Railroad Men Are Flocking Back into Train Service to Allow Regular Crews an Opportunity to Enlist.

BY FRANK KAVANAUGH.

EXTRA East, Engine 2282, was laid out at a blind siding for a first-class train. Near where the locomotive stopped, just to clear the main line at the lead-out switch, was a clump of trees.

The engineer left his engine in charge of the fireman and sat in the shade of the trees, where the wind blew warm and brisk, and brought a smell of new-cut alfalfa with it. From his overalls-pocket the hoghead drew a well-thumbed volume, and was interested in its pages when the conductor happened along.

One glance at its pages interested the way-bill carrier.

"What's that you're reading, Bill?" he asked.

"It's a new book," the engineer replied.

Just a Bit of Light Reading.

"But what's the matter with the letters?" insisted the conductor. "They look as if they were in the last stages of infantile paralysis."

"It's Sanskrit," replied the engineer as he turned a page. "Mighty fine writer—this fellow."

The engineer was professor of languages in a fresh-water college at one end of the division, but the call of the road and the needs of the war had brought him back to where he was before he had saved money enough with which to attend college and win a degree.

Pensively he looked back along the forty-odd loaded coal-cars he was pulling—and forgot to sigh. The weather was hot on the Kansas prairies; sweat ran down his backbone; his face was dirty and his arms sore—but it was life, and he was "doing his bit."

Men who have weaned themselves away from the road are now going back, one by one. It may not be because they like the life, nor that they are exactly patriotic enough to give up all the comforts of a nice home and clean linen all day long. No one seems to know why the old heads are coming back.

But, with the shortage of trained men, due to the enlistment of the younger element, more and more men who have divorced themselves from the railroad game for years now go before the division physician, and are as tickled as a child with a new toy when "sawbones" gives them a clean bill of health.

As a middle-aged bank cashier said, as he stood, clad in a brand-new suit of overalls:

Freeing Young Fellows for the Front.

"With the young men going to fight and the railroads calling for men to fill their places, I couldn't resist the temptation. The swing job on a coal-drag is like a vacation to me now."

He signaled to the engineer to back up, and the man ahead didn't see him.

"What d'ye think you're doing back there?" he called, lapsing into the language of long ago—perhaps ten years. "Think the hog law's got you?"

And so it goes. They work sixteen hours and rest eight. Or they think they rest eight hours, but they don't.

The eight hours' "rest" begins when the train is registered in. Then there is a few minutes taken to clean up, a few min-

LOCOMOTIVES & SHRAPNEL
Our Nation needs locomotives as much as shrapnel.....
Ordinarily, 15 percent of all the locomotives on our railroads are in the repair shop. By reducing that percentage to 10 we can add 3325 locomotives to the number available for use on our railroads. If we can keep more locomotives in good running order, we will help our country in the war with Germany.
THE NATION IS COUNTING ON YOU

SUCH POSTERS AS THIS BRING A SENSE OF RESPONSIBILITY HOME TO EVERY RAILROAD MAN

utes more to eat something, perhaps something that's cooked at home, then maybe a look at the daily papers and then to bed.

About two hours of the rest is taken up before a man's eyes close in slumber. Then, an hour or so before the eight hours' rest is up, comes the call animal with his book and heavy shoes—and it's the dull grind again—out with a drag of "red-ball" freight, or a mile of coal-cars with a heavy engine heaving at them—and the muscles grow hard again, and the well-manicured nails grow rough; sun, wind, and cinders tan the skin, and the new old-head railroader tells of the time when one was lucky to have three or four "air" cars to a train.

He, often as not, sleeps in his overalls—and to Gehenna with appearances.

"Aren't we all fighting this war?"

It's the call of the great outdoors.

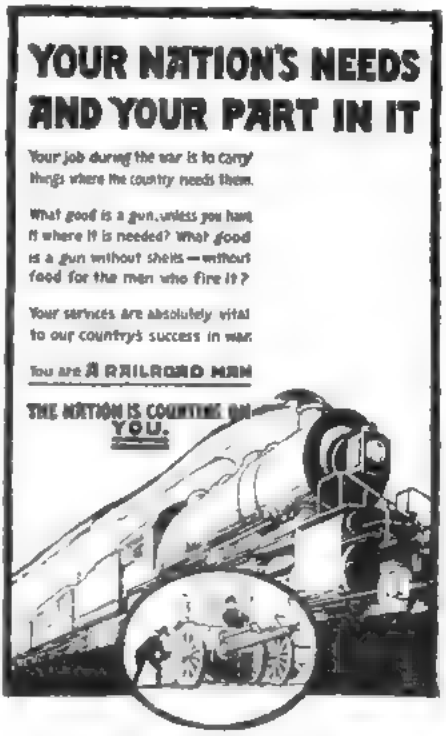
And there are compensations for the dirt and dust and sunburn. There is the beauty of a new morn. It's a pleasure to sit on the cupola of the caboose, at the tail-end of a long string of swaying, noisy box cars and watch the smoke from the stack up at the head-end rise and lie just above the late path of the train.

And the jack-rabbits shoot across the prairie, then stop a while, with ears straight up, until the train has almost passed them. Then, affrighted anew, they start and leap across the wire grass, flying tufts of gray fur. The bank director's desk or the professor's rostrum never offered anything like that.

When You Feel Poetical.

Then, at night, when the lights in the farmhouses are extinguished and the whole world seems asleep, and you feel alone, as if the fireman on the other side or down in the gangway were a thousand miles away, and the rails run sharply down to a curve as if to disappear in the lower regions—it's then that

> You feel the end of the tangent—brace your elbow for the swerve—
> Glance back and watch the tail-lights follow the train around the curve


YOUR NATION'S NEEDS AND YOUR PART IN IT
Your job during the war is to carry things where the country needs them.
What good is a gun, unless you have it where it is needed? What good is a gun without shells—without food for the men who fire it?
Your services are absolutely vital to our country's success in war.
You are A RAILROAD MAN
THE NATION IS COUNTING ON YOU.

NO WONDER THAT THE OLD HEAD GIVES UP A GOOD JOB AND GOES BACK TO RUNNING TRAINS!

And you swing your weight on the handle of the whistle-valve above you and watch for a winking red light turn to green. The rattle over the frogs wakes echoes in the little village you clatter through, the dogs bark and sometimes—only sometimes—you envy the people who sleep, until you suddenly remember that you are "doing your bit," and will one day have a place with a billion or two others in the war history that is being writ.

And when your drag drops slowly over the switches of the division-end! There are pie and coffee and a few hours' pounding your ear; and you sleep better than you ever did—the sleep of utter exhaustion. There is no rolling and tossing in bed, thinking of to-morrow.

Until the caller comes again, it's just one short period of trancelike snoring. The new old-head railroader never gets enough sleep. There's too much to do and too few men to do it.

That the brotherhoods will be enriched by the addition of the men of former years is evident. Labor unions fall into a rut in the transaction of business, just as firms do; they either grow egotistic, like men, or retrograde.

Balance-Wheel, Maybe, for Brotherhood.

After a success like that of the eight-hour day, there is sure to be either an overbalance of egotism or a self-satisfied retrogression.

The new old-heads will bring fresh ideas and new thoughts to the councils. They have been out of the game so long that they will prevent the self-satisfied, smug conceit that occurs just before a fall, or the aggressive trend that carries with it injustice to the other side.

New blood helps. The older men come from different walks of life, and have been brought into contact with men of different thoughts and radically different ideas.

One thing that is bound to occur is the extension of the rest-time between trips—by legislation if necessary, but arbitration if possible. Another thing will be the cutting out of a lot of delays incident to the change of engines and crew at division-points.

A New Mexican cattle-shipper has a brother who once was a trainman and who, when the war brought a shortage of men, went back to the service. The former trainman is at present one of the Legislators of a Southwestern State. He has figured out where forty minutes can be saved in transferring a train from one division to another—changing engines, crews, *et cetera*.

If he goes back to the Legislature next term, which he has a good chance to do, he will have first-hand knowledge of the subject, and, by helping cut the red tape of the division end, will save the railroads, the cattlemen, and the trainmen time—and time is money.

Gave Engineer the O. C. I. Sign.

There is a man pulling a freight-train on a road which runs through a farming community. Three months ago he was sitting on the bench—a judge—elected by the farmers of his county.

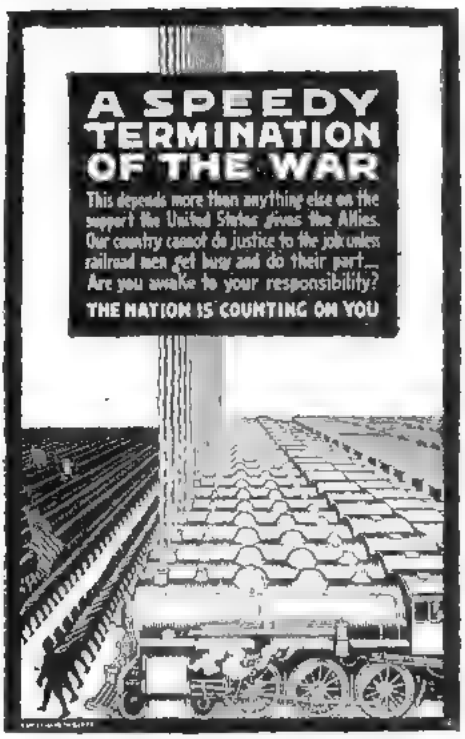
Just the other day he was making time along a smooth section of his division which paralleled a well-kept country road. A farmer in a big motor-car whizzed along on the country road, making as good time as the freight. A mile ahead, the engineer-judge saw where the country road crossed the railroad, and he began to wonder if that farmer was going to try to beat the train to the crossing and make it over the rails before the engine.

Apprehensively the engineer slowed up slightly; and sure enough, the farmer passed in ahead of the train, escaping death by a few feet.

After crossing, the man in the auto slowed up until the engine came by, and showed his gratification at beating the train by placing a thumb to his nose and wiggling derisively the rest of the digits of that hand.

All of us have seen the sign. It's supposed to be the grand hailing-sign of the Order of Cheerful Idiots, and there was a time, when we were sweet sixteen, and full of pep and green apples and calf-love, that it was a sign of a fight or a foot-race, according to who made it.

After the engineer had ceased trembling at the narrow escape of the motorist mak-


A SPEEDY TERMINATION OF THE WAR
This depends more than anything else on the support the United States gives the Allies. Our country cannot do justice to the job unless railroad men get busy and do their part... Are you awake to your responsibility?
THE NATION IS COUNTING ON YOU

FORWARD, MARCH, RAILROADERS OF MILITARY AGE! COME ON, YOU OLD HEADS! ROLL 'EM!

ing true the Missouri saying, "A fool and his auto is soon hurted," he remembered that on the October docket were three or four automobile-injury cases in which a railroad was charged with the blame, and he wondered if the juries hadn't been a little harsh in blaming railroad men with every accident that got into his court.

Not until then did he remember that the pilot of a big locomotive can't turn it out of the way of a speed-nut with an auto steering-wheel in his hand and a species of mahogany in his head. He will think of things after this in a different light.

At the commencement exercises of the high school in a well-known city in Iowa, the principal, a former trainman, made an excellent address to the graduates. Some of them, he knew, could not afford a college course, and to these he especially aimed the shafts of his oratory.

"Be conscientious," he said, among other things, "and make your employer's interests your own. You may not think he is noticing you, but he is."

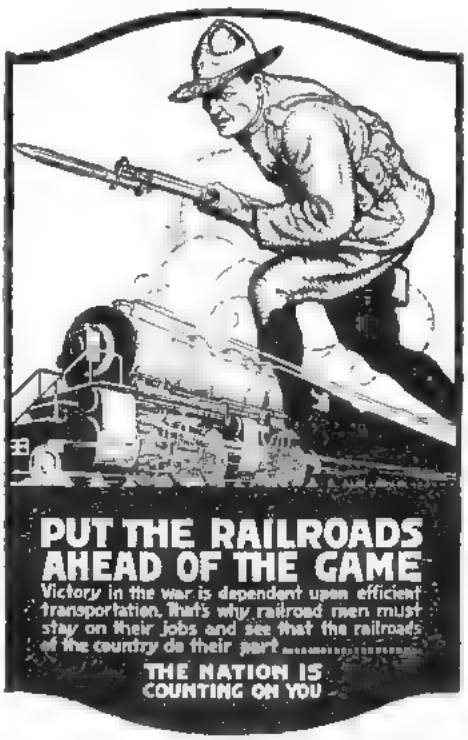
A month later that same professor was head-end man on a forty-car train of soft coal. After the train had reached the division end, he was walking through the yards toward the hotel he now called home

He had been on duty fifteen hours, and, therefore, was not feeling as fresh and lively as he did the day of the commencement exercises. An old woman was picking up coal along the tracks in the yard.

What the Amateur Cop Got.

"My good woman," he began, "without considering the fact that you are appropriating company property to your own use, and at the same time trespassing on the grounds of the railroad — an offense punishable by a fine of not less than five nor more than fifty dollars and confinement in the county jail for not more than sixty days, or both fine and imprisonment —you are endangering your life. You must leave the property of the company at once."

Just then a son of the old woman, a


PUT THE RAILROADS AHEAD OF THE GAME
Victory in the war is dependent upon efficient transportation. That's why railroad men must stay on their jobs and see that the railroads of the country do their part
THE NATION IS COUNTING ON YOU

THE STEAM BEHIND THE BAYONET THRUST HAS A GOOD ALLY IN THE STEAM THAT TURNS THE WHEELS.

husky section-hand who hailed from somewhere in sunny Italy, came around the end of a freight-car.

"You call-a my-a moth' bad-a name; I leeka you," said the son in a dispassionate tone, and at once proceeded to put his words into action.

When the Italian got through with him, the young college professor had changed his point of view, for he lost three trips convalescing and drew ten demerit marks. Now his motto is:

"When you see it done and it isn't lawful, either forget it or tell the railroad bull. He carries a big gat, and it's his business to fight. A brakeman's business is to brake."

Little Johnny Jones, the Courtesy Kid.

Little Johnny Jones — to hide his real name—was graduated from a second-class college back East, and then returned to his home in the West with a lot of theories and a diploma. His father, a well-to-do wholesale grocery man, put Johnny "on the road" with a well-chosen line of foodstuffs for the hungry.

Johnny got orders, but he also got the goat of every man he came in contact with while traveling. He kept the hotel stenographers busy with letters to the various railroad companies, calling their attention to the fact that courtesy was a forgotten art with trainmen and station ticketmen and baggagemen.

At first the companies replied to his letters with some more courteous, but in the end he got to be a bore, even to the complaint department, and his letters hit the waste basket without hesitation. Headquarters began to make his acquaintance, and they dropped him.

Then war was declared. Johnny, having some of the aggressive blood of his father in him, immediately enlisted, and was sent back home from Jefferson Barracks within a day after he arrived. He wasn't physically perfect, as an American soldier should be.

Rather than return home and face the folks as a physical failure, Johnny got a job with the terminal company in St. Louis. He did something in the baggage department, 'way down below the passenger-room, and just one week of that work satisfied him railroaders have their side, too.

Now he is traveling for his father again, and there isn't a rule for trainmen that he wouldn't overlook, even if it did inconvenience him a little. He reports no employee any more. That one week with the trunks in the baggage department effectually cured him.

He wonders how the conductor ever gets seasoned to the thousand and one questions asked him; and if a fussy passenger threatens to report a brakeman because that official can't tell when the through Chicago-Portland train passes Oronogo Junction, and if it stops there long enough to take on passengers, Johnny smiles to himself and, when opportunity offers, gives that brakeman a big cigar to smoke when he gets in. The war has done some good!

Local Color to the Front.

This article is written in the caboose of a soft-coal drag. The wind gathers all the dust off the coal and deposits it right in the car, covering the seats, bedding, and the cooking utensils.

The hind brakeman is boiling a pot of beans on an oil-stove, to the tune of "Casey Jones" and "Tipperary," whistled in juxtaposition, as one might say. Incidentally, I might add, the beans in that pot are worth twenty-five cents, retail, and weighed one and one-half pounds.

The head man, who three months ago preached every Sunday to a little flock out in a Missouri town, now wears whiskers that started to gather dust a week ago. He wouldn't want his congregation to hear what he says and thinks when a drawhead pulls out and he has to lug a heavy chain half a mile.

But we don't mind the heat and dust. Outside the caboose, just under the number, hangs a large sign, which announces:

MY REGULAR CREW
HAS JOINED THE ARMY!
HOW ABOUT YOURS?

The sign was painted by the man who now is boiling beans. He was cartoonist on a daily newspaper three weeks ago The regular conductor is engaged in the gentle art of drilling a militia company out at Fort Riley.

The two regular brakemen are with the railroad corps; perhaps "somewhere in France" by the time this is read. No wonder the caboose is proud of its regular crew.

And one of the important factors in bringing us old boys back is the series of patriotic posters for railroad men, some of which are reproduced herewith. They are issued on behalf of the Railroads' War Board.

THE BUILDERS.

BY LYDIA M. DUNHAM O'NEIL.

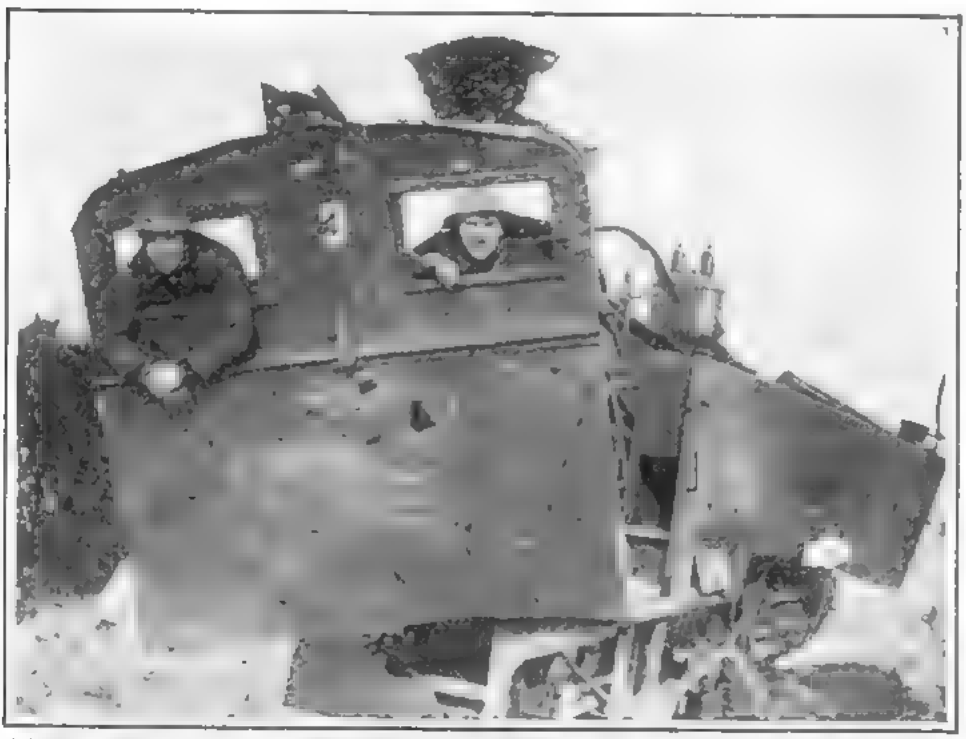
NOT theirs the thrill of the master's heart when the train comes clanging down
Over the ringing, shining rails, into the heart of the town.
Not theirs to fight with the storm and night, and to know the joy sublime
Of a battle done, and a victory won, when the train rolls in—on time!
The throb, the purr, the heave and whir, not theirs to understand;
The leap and swerve on steep and curve, nor grind of brakes on the sand.
They may not sit where the shadows flit, nor follow the headlight's gleam
O'er the pathway dark; they may not hark to the siren song of steam.
But part of their brain and part of their soul is there, though it be not seen,
And the builder's pride's in the hearts of the men who made the huge machine.

POUNDING, throbbing, thundering down, closer the mogul draws;
A hand on the brake, a grip on the wheel, a groan, and a restless pause.
As bright as stars are the varnished cars that pause for the briefest stay,
For east and west on an endless quest they must hasten day by day.
Beauty and grace and speed for the race—all these in every car;
Not theirs to know, who made them so, the charm of the country far.
The strength of steel in truck and wheel, that they may safely roam,
Mile after mile, and all the while the builders toil at home.
But part of their brain and part of their soul is there, and it wanders far,
And the builder's pride's in the hearts of the men who made each mighty car.

GLEAMING, glimmering, glittering bright, at midnight, and at noon,
In the drowsy heat of the morning sun, or the light of the pale cold moon,
From south to north the rails go forth, from east to farthest west—
Where the cold wind blows o'er frozen snows or the south wind lulls to rest.
Though sweet perfumes of tropic blooms swing o'er the far-off hills,
Though the call of the West may stir the breast of the men in the rolling-mills,
Not theirs to heed where the white rails lead; not theirs to follow the gleam;
Not theirs to care where the engines fare, and the headlight throws its beam.
But part of their brain and part of their soul is there, on the far-off trails,
And the builder's pride's in the hearts of the men who made the rails.

ROLLING-STOCK UNDER GUN-FIRE.

IF YOU HAVEN'T ANYTHING BETTER TO DO YOU MIGHT AMUSE YOURSELF COUNTING THE HOLES IN THESE SHATTERED COACHES WHICH WERE TARGETS FOR THE BOCHES ON THE ARRAS FRONT



A LIGHT ENGINE UNDER THE HEAVY GUN-FIRE OF MODERN WARFARE STANDS VERY LITTLE CHANCE OF COMING OUT OF THE SCRIMMAGE WHOLE, AS IS SHOWN BY THIS OFFICIAL PHOTOGRAPH JUST RELEASED BY THE BRITISH WAR OFFICE

FROGS.

New York Legislature has made it a misdemeanor to get on or off a moving train.

Five more engineer regiments are now being recruited by the army, one of them to build light railways.

David Allen, a Pullman porter on the Santa Fe, runs his own eight-cylinder automobile in his spare hours.

Chicago and North Western employees are all chipping in to buy Christmas presents for the road's enlisted men.

Agent at a station in the West works under broiling sun because he won't disturb a sparrow that has built a nest in his awning.

The Railroad Y. M. C. A. is striving to have a representative on every train that carries soldiers to the national army cantonments.

A baggageman named Ireland fell off a fast Burlington train with a trunk, at Laclede, Missouri, and landed unhurt, sitting on the trunk.

From November, 1916, to August 27, the Southern Pacific shipped from California 9,903 carloads of fruit, the largest movement in history.

At the Sheepshead Bay track, New York City, Louis Chevrolet, driving a Frontenac car recently, traveled 100 miles in 54 minutes 20 98 seconds.

A woman on Southern Pacific train threw a lunch-box out of the window with her ticket in it. Next day it was found by a brakeman and her money refunded.

A baby chewed on triple cord of a telephone, causing a loss of nearly two hours to effect repairs. A wet bouquet laid on a cord caused a loss of ten hours' service.

Three Southern railroads have applied to the Georgia Railroad Commission for authority to disregard law which prohibits operation of freight-trains on Sunday.

In 1916, 10,000 persons were killed in railway accidents in the United States. Of these, 291 were passengers, 2,941 employees, and 6,769 trespassers and others.

The largest single consignment of coffee ever recorded, 106,000 bags, reached the port of San Francisco recently for shipment to the East. It was valued at $2,000,000.

Men working on Alaskan Railway report that the thermometer sometimes registers 50 degrees below zero at one point. Tunnels are blocked with icicles as thick as a barrel.

More than 2,500 employees of the Pennsylvania Railroad have organized a Tobacco Fund to keep every former employee now in government service supplied with smokes.

To meet war conditions, many railroads have changed their age limits from 21 to 35 years to 18 to 45 for firemen, 18 to 50 for trainmen, and 18 to 60 for other employees.

The Postmaster-General is already laying plans for an aerial postal service, and Congress has been asked to authorize the Secretary of War to turn over to him all non-military planes.

United States navy's new high-power radio station at Pearl Harbor, Hawaiian Islands, established a new world's record by sending a message to Sayville, New York, a distance of about 5,000 miles.

We talk lightly these war days of a billion. To carry the bullion required to mint this amount in silver dollars would call for 2,083 freight-cars, hauled by 104 locomotives, the whole train extending over fourteen miles.

SEEN THROUGH THE CAR-WINDOW.

A RAILROAD seldom forgets its forebears.

Thirty-seven years ago the Union Pacific Railroad erected to the memory of Oakes Ames and Oliver Ames a great monument of stone, a peculiarly fitting tribute to the sturdy constructors of the sixties whose efforts resulted in President Lincoln's famous steel highway to the Pacific.

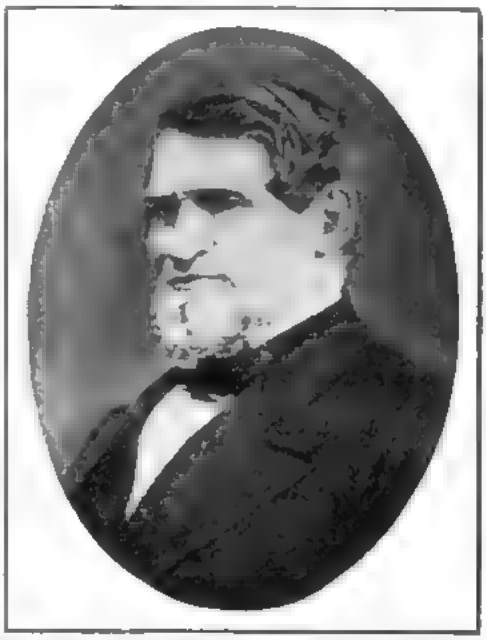
Then, after many years, the Union Pacific relocated its line across the summit of the Rockies, and the poor old monument was left out in the cold, five miles from the right-of-way over which it had stood silent, majestic guard for almost four decades past.

Now the railroad is going to make reparation for its neglect, and the Ames Monument is to be moved right straight back on the line to a handsome site at Sherman, Wyoming, just east of the station.

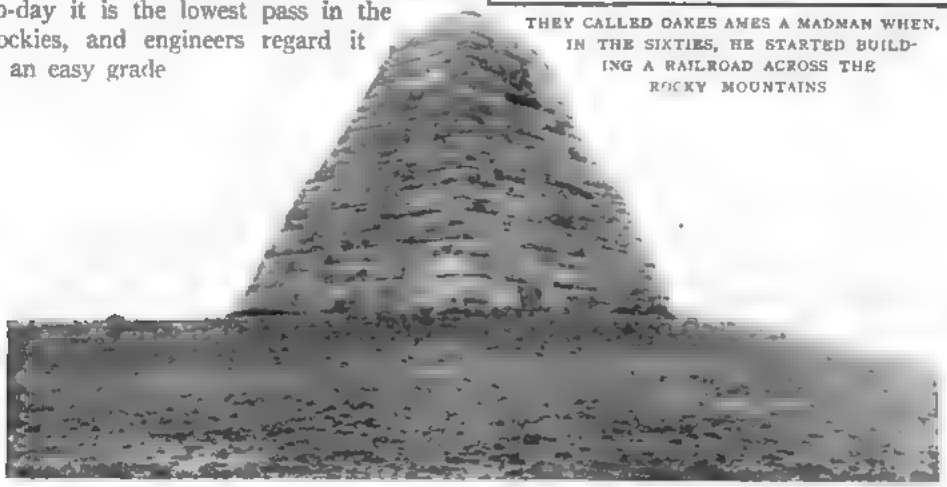
Shortly after Civil War, Oakes Ames announced that he was going to build a railroad over the Rockies. He was laughed at and jeered in Congress, and one big railroad man said, "Only a madman would attempt such a job."

But when rails were laid over Sherman Pass, at a height of 8,000 feet, the work was considered one of the world's wonders. To-day it is the lowest pass in the Rockies, and engineers regard it as an easy grade

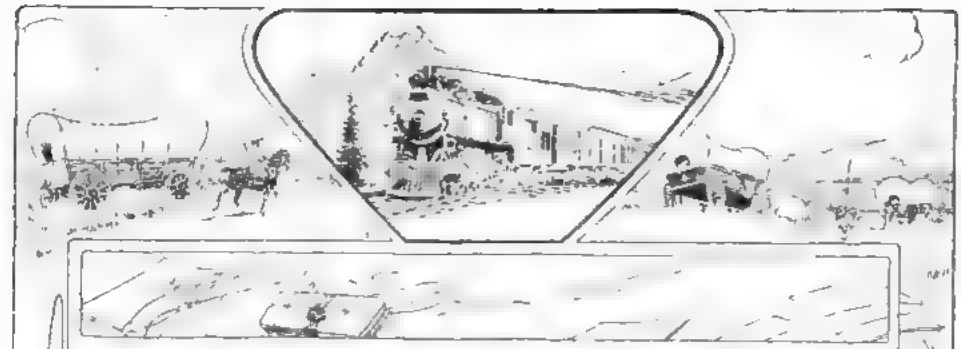
The Oakes Monument is a huge granite pyramid, 60 feet square at the base and 60 feet high. It will be taken down a stone at a time and carried on wagons and "snowboats" to its new site across the mountain. On each side of the monument is a bronze medallion of one of the brothers. Thus Oliver is honored equally with Oakes, though the latter was the leader.



THEY CALLED OAKES AMES A MADMAN WHEN, IN THE SIXTIES, HE STARTED BUILDING A RAILROAD ACROSS THE ROCKY MOUNTAINS



BUT LATER THEY BUILT A MONUMENT TO THE MEMORY OF THIS GREAT CONSTRUCTOR OF THE UNION PACIFIC



SONG OF THE EAST-BOUND.

BY JAMES W. BENNETT.

AGAIN—yes—don't you hear it,
That lonesome siren note?
The east-bound for Chicago!
It's sobbing down its throat.

That whistle's mighty eery—
Just like a child that moans;
It echoes through this desert
A shrieking its weird tones.

Yes—there she comes a humming,
A clacking right along;
A racing o'er the road-bed
Her drivers sing a song.

She's flashing bright and lighted
Just like a big fire-fly;
Her old smoke-stack's a belching
The sparks up to the sky.

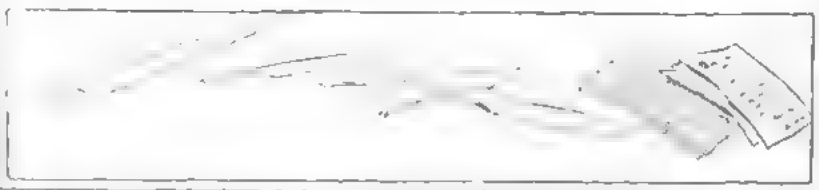
And then she passes by me,
A whistling as she goes;
Her whistle's speaking to me;
I'm sure that east-bound *knows!*

She's singing consolation
That I am not forgot—
That they-all still remember
Back there, as like as not.

Her tail-lights now are gleaming
A waving red farewell;
She's going toward Chicago,
This desert life is hell!

I sit here in my cabin,
And watch that train go by;
I'm longing for that east-land;
I kind of want to cry.

But the sawbones said to come here;
There's trouble with my breath;
I'd just as lief go back, though,
Back home to joy—and death.



WITH THE TRAVELING AUDITOR.

The Accounting "Trouble Man" Has to Solve Problems in Human Nature as Well as in Figures.

BY P. G. ESTEE.

AS a green young opr I used to rather envy the traveling auditors for the railroad and express companies when I would see them riding at ease in the varnished cars while I perspired with trucks of baggage and express. Fifteen years on that particular job have given me a different view-point.

I was still a young chap when I received my appointment as traveling auditor for the railroad company; they took men off the line then, men who had run stations. Now, as a rule, some bright young fellow comes out from the general office.

Saying nothing reflecting on the ability of the latter, the other way has always seemed best. It was a line of promotion open, and it gave the young agents an incentive to watch the bookkeeping side of their work.

To be a successful auditor one must possess in addition to accounting ability something of the diplomacy of a war-time ambassador. The constant problem of "balance" is a hard one, but greater than that are the problems in human credits and debits that come up to the auditor when he finds "trouble" other than that caused by carelessness or plain error.

Fired for Being "Too Easy."

The former are the ones that worry me—or used to worry me. I was discharged two years ago for being too "easy" on my territory. I rather like to look back and remember that my kind of easy saved a lot of chaps from finishing a bad start in prison; or at the least, from losing position and bond standing. I found few cases of downright, planned dishonesty, and some of those cases are good citizens and employees right now.

Perhaps it was fortunate for me that my very first station "check" showed me that figures were apt to be the smallest part of a successful auditor's work. An adding machine, you know, can get correct footings.

First Check a Near Tragedy.

My territory then was between two and three hundred miles of busy central Western railroad studded with stations, and the first instructions from the general officer were to go to M—— and check the accounts. At that place I met the auditor for the express company, an elderly, brusk man, whom I had known in my station student days.

The agent greeted us cordially, turned over the keys to the cash drawer, carried his mail to the post-office, and came back to chat a moment.

"Want you fellows to eat dinner with us," he said. "Live up stairs; going to have duck for dinner. Got to run down to creek and shoot a couple right now." He showed us his gun.

"Wait a moment," snapped the express man. "Go up-town and get me two dollars more on this machinery shipment. If they object, tell 'em to come down and see me."

The agent seemed about to protest, but finally departed without speaking. He was hardly out of the door when the old man ran over and seized the double-barreled gun, and ejecting the shells, cut the top wad and removed the shot.

"Just a joke," he assured me.

I had my doubts, especially as the agent

returned almost too soon and stated that the dealer would be down later. He took the gun and started away. Five minutes later there came a double report from the little creek back of the station.

"Pulled 'em both," grunted the other auditor. "Let's go down and see how he takes the joke."

Down by the creek we found the agent wandering in a dazed circle, half blinded by the blood that dripped from his face. Even wads will hurt when fired at the head with the muzzle half an inch away. Suicide had been his idea, and the express man had, in baseball parlance, "outguessed him."

Gipped Both Railroad and Express.

We found reason enough a little later. Unpaid express C. O. D.'s amounted to several hundred shortage, and on my side collected freight-bills for which no remittance had been made showed up another three hundred. Meanwhile we had called a doctor, explained an "accident," keeping the agent with us and going to dinner with him.

I did the necessary wire work; in fact, the ability to handle a key has been of use lots of times, although not many of the men knew I was an operator. Lots of times I heard things about myself, and once—well, that's another story.

After we had the shortage located and footed, the older man took full charge and went after the agent verbally. Didn't say a word about arrest or prison; just tried to show him the folly of his gambling, and how by killing himself he was but adding to that folly and adding ruin to the life of his nice little wife.

He put new life into the man, and finally we went to the bank with the agent, told his story to the old president, and helped him borrow money to cover the shortages. Then we had him resign account of "illness" and helped him locate as a hired man in the country.

We told him that at the end of a year we'd boost him into a job if he wished and had kept straight. Meantime his bond record was safe with us.

He kept straight, later got hold of a small farm to rent for himself, and decided to stay off the line and away from temptation.

Right then I began to see that there were machine auditors and men auditors. I wished to become a man auditor like my old friend of the express.

I do not mean that I believe in condoning deliberately planned crime, but many, many times irregularities came before me, that had I followed the strict interpretation of rules, offered cause for a report to cold-blooded bond companies, loss of position; perhaps prison. A heart-to-heart talk, an appeal for better efforts and habits generally accomplished what the former method would not.

As for accounting troubles, the "pigeonholer" was the man I disliked—the man who was always going to make a trial balance to-morrow,who had meant to enter up the journal voucher and take credit, but left it until next month, *et cetera*. It's a case of check with those fellows from the time of your last visit until you are up to date again.

The pigeonholer does not believe in worrying. Let the other fellow do it. If a balance-sheet is off a few cents, why bother to check, the auditor will do that.

He "forces" it. It never hurt my conscience to give those fellows black marks, that is, after I had explained and asked them for better service.

The liquor drinker was another to whom I extended only so much grace if his work showed neglect. The fact that lives are in the hands of such a man determined my course in those cases.

Books can be fixed and balanced in time. A score or so of dead and maimed passengers cannot be balanced in any manner.

Chasing Bootleggers on the Side.

Lots of things are referred to the auditor, which, strictly speaking, are no part of his daily labor. I remember one such case that afforded me plenty of amusement and no little satisfaction.

The superintendent told me that the local authorities at B——, were complaining of bootlegging, and claiming that the local agent was assisting the law-breakers.

"Our special officer failed to land anything, but they were wise to him. Can't you check things there and keep your eyes and ears open?" he asked me. "If our man is mixed up in that business we want him out of the service, and quick, too."

This was surely out of my line, but I offered to do my best, and figuring that Saturday was a good day to reach B——, asked the general office to have my papers ready for that date. I purposely managed to be "off" between the freight received and abstracts, and checked diligently, making many trips for old records to the little loft over the freight-house. I also insisted on a thorough check of "on hand" freight, and went over the warehouse carefully.

Not a clue or suspicious item showed up, and I was ready to give the young agent a clear bill in spite of the opinion of the local officers when No. 29, a local passenger, pulled in.

Didn't "Watch Her Step."

Naturally I was on the watch for suspicious passengers or packages, but neither were in evidence. Most of the latter were salesmen, who alighted and hurried uptown. One fairly good-looking but rather austere-faced young lady who walked with a slight limp, came into the waiting-room, and when the agent came in and called him to the window to ask about some train up the little branch from B——.

I had neither suspicion or curiosity until I heard the tap-tap of a pencil. I think I mentioned that I was an operator.

Well, that girl was telegraphing with the pencil, and I caught five letters before the agent knocked over his ticket stamp and made noise enough to drown out an exhaust pipe. "Leg wr," she had tapped. Wr is telegrapher's shorthand for where, and you will admit that was a funny question for a young lady to be ticking out. For a moment or two the significance did not strike me. When it did I finished my balance in a hurry and announced my intention of catching a north-bound extra which was following twenty-nine.

"Can you 'OS' 29 for me if 'Di' calls while I'm out with the mail?" asked the agent as the girl left the counter.

"Never touched a key," I lied with a cheerful face.

He was mighty anxious to know if I had caught the pencil stunt, that was sure.

It took some clever work to only pretend to board that freight caboose and then get back into the warehouse and up into the book loft. I made it, though, and crawling over the books, worked from rafter to rafter until I was over the waiting-room.

The girl sat there demurely enough until the extra was gone and all the loafers moving townward. Then, from the crack I saw her working toward the warehouse, and slipped back and found an eyehole above.

She wasted no time once out of sight of any one in the office or on platform. She moved some carefully arranged blocks of coal in the station supply bin, disclosing a little tube, then may I be forever off balance if she didn't unfasten her limb, a good sized wooden one, and pour the contents down that tube, carefully conceal the tube, and with the limb once more in place, stroll out.

After having the agent and the demure young lady arrested, we discovered two things. The tube ran over to a grain elevator basement, and the young lady was a young man cleverly disguised as a girl.

Twice or three times a week he would slip in, leave a legful, go up the branch to a "wet" town, and come back with another.

New Way to Cut Red Tape.

It was a maiden lady of uncertain age who came out from the Western Union city service and was given temporary charge of a very small station one busy autumn that compiled the most revolutionary balance-sheet that ever went into headquarters to upset precedent and the dignity of the department. I am not saying but what she had the right idea, either.

We all know how the red tape of supply ordering runs:

Requisitions to the superintendent, O. K.'d to the storekeeper, and then a wait for the supplies needed and perhaps as long again for some workmen to come from the shops and install the articles, if they were that kind of supplies. To ask a railroad

to handle supplies any other way in my time would have been like asking a politician to work ten hours per day for one year, or an old-time judge to render a decision in less than six months.

The little station had needed window curtains when our lady friend took charge; she bought some with company money. There were one or two locks missing, and she bought locks and had a local man fit them, again using company money.

As she could find no blanks for such items, and needed the credit, she turned to the monthly balance-sheet and made special entries of the amounts.

She had checked "over" some perishable freight, with no marks, and had promptly sold it, debiting herself the amount on that comprehensive sheet. Again her system was really better than bothering with the many carboned sales sheets and long-winded messages from the claim department, but the chief told me to run down and give her some first-hand instructions.

"Mighty Dinah!" exclaimed the lady agent. 'Do you mean that when a door needs fixing and I can't do the work I've got to write or wire and wait? Tramps might have got in and stole a hundred dollars' worth of Ed Davis' dry-goods without those locks."

I admitted that her theory was right, but added that as long as our names hung on the company's board we would have to obey the running orders handed us.

"I am going to quit," she announced with determination. "Mighty Dinah! I'll work for no company that won't let me use my judgment—anyway, seventy-five cents' worth." And quit she did.

Stood a Bawl-Out for Effect.

The oddest request I ever had made of me was by a gawky young agent whose accounts I was checking for the first time.

He inquired most earnestly if I would not do him a great favor, and I replied that I would do anything possible.

"Well, sir, some of these town fellows make life miserable for me. They know I'm pretty green and they say I am afraid of my job and all that.

"Now, they know you are a sort of official. Con on 84 told 'em so. Let me bawl you out before some of the bunch."

I had not replied—was too busy laughing—when some of the town cut-ups came along and began to address some cute remarks to my young friend.

Instantly he turned on me and ejaculated fiercely.

"I'll not scrub that floor, not if you discharge me!"

"But, Mr. Agent," I protested mildly.

"Take my keys," he roared and threw them at me. "I'll not work for a corporation that hires men like you to browbeat us workers. I say again, I will not scrub."

Inwardly choking with laughter at the heroic figure he tried to cut I pressed the keys back and assured him that we would respect his manhood. He need not scrub.

He accepted them with dignity and then turned on the town bunch and read them a Julius Cæsar riot act, which they took meekly and moved on. They respected him. Had he not sassed an official?

Mystery of the Cash Receipts.

The hardest problem that came up to me—in my line, too—was a series of money thefts that occurred one fall; just when business was getting heavy and every station was handling pretty good-sized cash receipts.

In quick succession three agents called for me, reporting that their cash was checking short and the only deductions possible pointed to an operator or helper as the guilty party. I went to each station in turn, investigated and checked accounts and was almost forced to the same conclusion, although the men suspected had been employed for some time.

My duty, according to red-tape code, was promptly to notify the bond companies, whose first move would have been to arrest, unless the men confessed and refunded, in which case the loss of position and blacklisting would have followed, at the least.

Tommy Durkee, operator at C——, was a personal friend, and when he protested absolute innocence I believed him. The cases were almost similar, and if Tommy was innocent the others must be. I found that the express funds were affected and

persuaded the express route agent to stand with me. We held back reports to the bond companies, and I went to work on the cases.

Each station robbed had but one man beside the agent; at one, a helper and at the other two the assistants were classed as operators. All these had known the combinations as well as the agent. Agents are held for station funds; not being allowed to leave them in the safes, except at their own risk, except at continuous night and day stations.

Two of the robberies had taken place during the day, the agent leaving the money in the safe while at meals or busy with freight outside. At the third station, a night office, the agent could not be blamed for leaving the funds. This robbery had taken place after midnight. At least the operator claimed not to have left the office until twelve-thirty and then for only thirty minutes lunch period.

Issuing special instructions to all agents I made Tommy's station my headquarters for a time, giving every moment possible to the puzzling shortages. I was at C—— one afternoon when No. 56 pulled in.

Band Ushered in Bad Luck.

"Another piece of bad luck due," Tommy said, with a wry face. "See that orchestra getting off? They were here and left their stuff the day we went short. The fellows didn't hang around and, of course, had nothing to do with our trouble, but I just now thought of the coincidence."

The members of the troupe took parcel checks for their horns and drums, being particular to handle them personally. I was still loafing about when they came in later and took the instruments. I learned later that they played for a dance in C—— that evening.

I don't know why, but Tommy's remark had started a train of thought that refused to take sidings in my mind. Finally, I gave it full rights and dropping into a seat at the instruments asked the other two stations if they remembered anything of an orchestra the day or nights of the supposed robberies.

Both answered yes. Instruments had been checked for a time, but none of the men were around for even five minutes. Both agents added that the musicians were beyond any suspicion. Nevertheless, that thought-train of mine kept the main line, and I had a friend secure a list of the orchestra's dates.

I followed that orchestra like a second section in a permissive block district, but there was not the least thing out of the ordinary, except that the four members always insisted on having one room and kept it locked from the time they took possession until they left town. Sometimes meals for all hands were ordered sent to the room. Nothing suspicious about that, or the way they entered the offices with their goods. I was about ready to confess that I was no old *Cleek* when, one night at 2 A.M., I passed C—— on a stock extra. Tommy had the red against us and came flying into the caboose.

"Jasperson, at W——, says that his cash is three hundred short. He locked the safe when he went to eat, but when he came back was worried and took out the money and counted it. He's about crazy."

I opened my note-book.

"Tell him to call an officer if he can, if not, use his gun if any one tries to take out the orchestra instruments. We'll be there in forty minutes."

Dad Meacham, with a big eight-wheeler, hit a mile a minute that night, and we beat the forty by ten minutes. Jasperson, a young chap, was on duty and pretty badly scared. No one had called for the instruments.

"Give me the gun," I whispered and, walking over to the big bass drum, delivered a full-legged swinging kick.

A Hunch That Won.

I was playing a hunch and playing it strong, too, but it worked out. There was a startled grunt followed by a groan. Jasperson nearly fell over.

"Come out, or a shot will follow that shoe of mine!" I shouted. At that there was a snap and the side of the drum opened up and a little, round-shouldered, dwarf-like fellow rolled out. I covered him and

sent the operator for officers, keeping the train crew to help if the others showed up before the officers arrived.

We nabbed the whole bunch that night and nipped off a mighty pretty scheme for side-line money for our orchestra friends. The little chap would be carried in the drum by the big man of the troupe and left in a position to watch the office work and front of the safe.

Sooner or later he would get wise to the combination as it was worked by some employee. He would know the habits of the force, and it was easy enough to slip out, grab the prize and be safely hid. As for the four musicians, their alibi was always perfect.

Poor Old "Twenty-Cent Mike"!

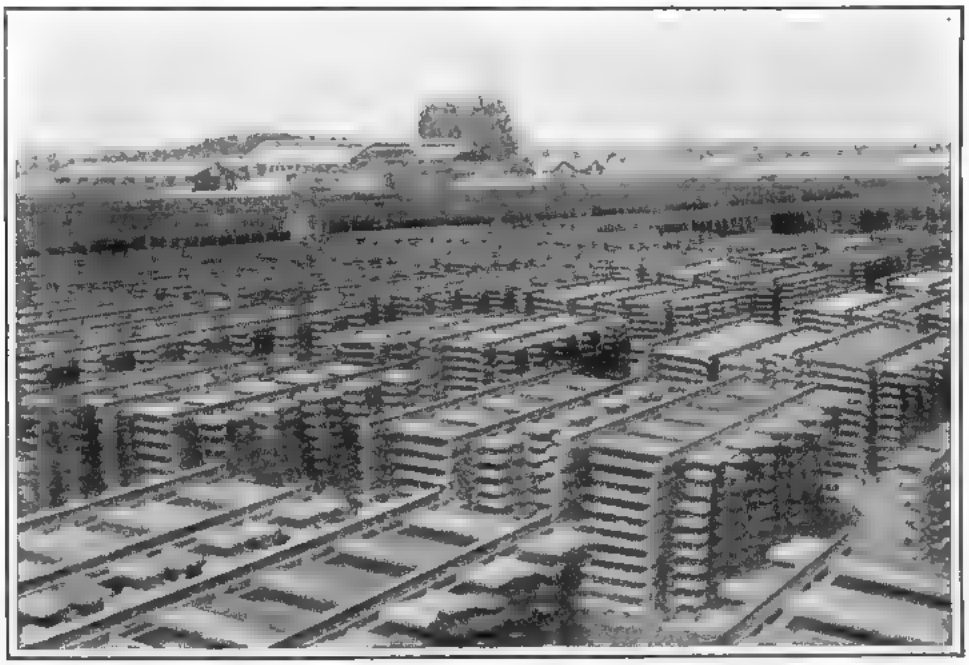
To some men figures are bogies which, like the old time giants, must be overcome each month. "Twenty-Cent Mike" was an illustration. He could not add the second row of a column and be sure of the result; invariably he would be twenty cents off on a number of different accounts and then he would foot and refoot, slipping over the first error each time.

Other agents I found were prone to transpose figures, the hardest kind of an error to locate and one that can be easily checked over without catching the elusive twist given the number. It is claimed that the amount of any difference caused by a transposition is always divisible by nine.

This seems to work out, but when an agent adds to the habit of transposition a failure in footing, then indeed the auditor who takes hold of his accounts has a task and might just as well settle down for a "check" first as last, and if, like "Twenty-Cent Mike," he has a weakness of his own, it is a busy day all around.

Problems in figures, problems in human nature. The auditor's life was never monotonous, for at every station I checked, something new along one of those two lines presented itself.

A WAR-TIME RAILWAY TRACK SUPPLY.



ALL ALONG THEIR BATTLE-LINES THE FRENCH HAVE PROVIDED STATIONS WHERE ACRES OF RAILS CLAMPED ON STEEL TIES ARE STORED FOR USE IN QUICKLY REPLACING THE LINES DESTROYED BY THE GERMANS. THIS DEPOT LIES NEAR THE MEUSE.

With *the* Inventors

THE engagement is announced of Miss Motor Truck to Mr. Railroad. The bride is a daughter of the gasoline engine, and the groom has a long line of ancestors with superheated steam coursing through every vein and artery. The spooning stage is well advanced, and the inspiring words have been spoken that link the rail with the odor of oil and new-mown hay.

Yes, the farmer will ride the rail, not in the old-fashioned way, but nevertheless he will ride the rail. He will mount his load of hay and motor to the nearest span of tracks; he will mount the rails and ride to town—on his load of hay.

That is what he is going to do, just as surely as you read this sentence. The times indicate it, and the railroads will not be adverse to it when they see the subject in the true light.

Already experiments have been made, and the plan has been shown to be entirely practical. A motor-truck can be constructed that will run on the ground and on the rail with equal facility.

The wheels will have the steel rim and flange, resembling the modern car-wheel, and in addition they will have a higher part like the ordinary solid rubber truck-tire, that will run on the ground and enable the truck to reach the farm or ranch and reload with vegetables or hay or grain or what not. Thus it is written, and thus it will be fulfilled

This may even be a partial solution of the food problem. A truck gets its load of produce at a farm, drives to the nearest railroad crossing, mounts the rails, and speeds at twenty miles per hour toward its destination.

To dispose of the food, many local laws may have to be altered. A farmer drove his truck to New York not long ago and tried to sell his food to the market people, who wanted something for nothing, according to the farmer's statement.

He next tried to sell the food to the populace by retailing from door to door, but was arrested because he was violating a local ruling of the city council. He was told that the food had to pass through "certain hands" first.

Perhaps the local laws there and elsewhere will be changed to fit the case and aid in the distribution of food. Possibly the problem will become big enough to be a national one to the extent of requiring national legislation.

Whatever the solution, the truck will take the rail, or the rail will take the truck, whichever way you choose to say it. It can be said either way with equal facility, and it can be done, too.

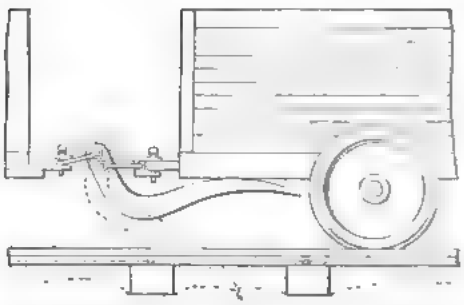
Let us frankly admit that it is easier to say a thing than to do it. The problem, however, will most certainly come forward for solution, and will be solved Already some of the railroad officials are dreaming about the matter, and the dreams are beginning to come above the threshold of consciousness.

Yes, there are a few difficulties. A few laws will have to be changed. A few inventions will have to be made before the plan works well; but the legislators can make the laws, and the inventors will find a way to make the inventions.

A BRAKE FOR STEEP GRADES.

FOR a mining car or a spur railway that ascends some steep incline, the brake shown in the accompanying illustration might have intrinsic value. It is cheap, simple in construction, and entirely automatic in its action. A glance at the figure will make the mode of operation quite clear to the reader with the inventive mind

The big iron brake-dog is practically a part of the coupling between the cars, and curves grace-



WHEN THE COUPLING BREAKS THE BIG DOG DROPS TO POSITION INDICATED BY DOTTED LINES.

fully beneath the car to the rear when the train is in motion. As soon as a coupling breaks at the point shown or between any two cars ahead, the scene changes quickly. The cars stop; the tension ceases; the big dog drops to the position indicated by the dotted lines, and bites its way into the earth of the road-bed or pierces a cross-tie by means of the protruding tooth.

There is no rearward motion of the train. The action of the brake is instantaneous, and the hold on the earth or tie is secured before there is any momentum to be overcome. The danger is prevented rather than stopped, which is a very desirable feature in any safety device.

It is obvious that a brake constructed in accordance with the idea embodied in the above description is of an extremely simple nature, and is particularly adapted for practical use by reason of the convenience and facility with which it may be assembled.

It is the invention of David L. Ainsley, of Mammoth, Pennsylvania, who has been rewarded with a patent, the number of which is 1,222,347.

NON-TELESCOPING CARS.

WHEN a collision occurs between coaches of a certain design and construction, the force of impact is converted into a rotary motion, so that the frame and flooring of the cars turn on a central pivot, clear out of the immediate danger zone.

In a general way, the invention comprises the usual platform, resting upon a pair of auxiliary platform sections, to which the trucks are fastened in the usual manner. The main platform is provided with a central bearing to receive a tubular pivot connected to the car body.

The car body is located on the main platform and provided with two strong pins, located centrally of the car, longitudinally, but out toward the sides, and one of these pins receives the force of collision and causes the rotation of the car body, and the other pin stops the rotating movement at the proper place.

An important feature of the invention consists in the arrangement of a valve, operated by the displacement of the platform sections, in such a manner that when a collision occurs the brakes are automatically applied, if the engineer has not previously applied them.

The patent is No. 1,234,809, granted to Franz Schohaus, a citizen of Germany and a resident of La Paz, Bolivia.

THE BRAKE-DOG.

YOU have seen the old-fashioned hand-brake on the old-fashioned freight-car, have you not? Some of the earlier ones were rather crude affairs.

The brakeman had to kick the brake-dog or pawl several times before it would bite into the spaces between the ratchet-wheel teeth and hold the brakes fast. Making the thing let go had its difficulties also, and was like breaking the grip of a bull pup.

All that is changed now, and with the best form of this device there is little difficulty encountered, although there is still room for improvement.

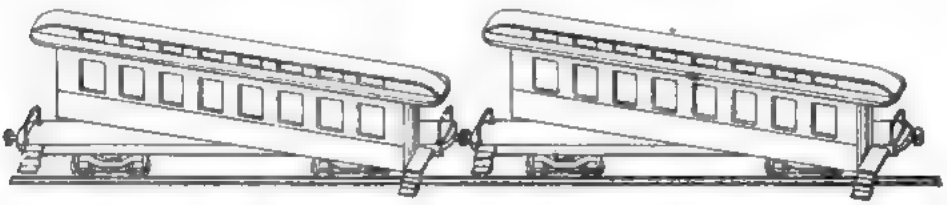
An old switchman, of Winslow, Arizona, has worked on the problem for a number of years, and has been rewarded with patent No. 1,137,300. His name is Albert Willson, and outside of his hours of labor he finds time to think, to experiment, and invent.

The device which he has patented has the same snappy action that is met with in the ordinary push-button electric switch, which when once started completes its movement automatically by the force of a spring.

A set of springs forces the brake-dog out of engagement with the ratchet-wheel when given a slight kick. Also, reengagement with the ratchet-wheel is established by a gentle kick and the action of the same set of springs.

PLATFORM TRUCK BRAKE.

THE ordinary baggage-truck that is used around the platform of the average railroad station has been known to start off on its own accord in



WHEN COLLISION OCCURS THE FORCE OF THE IMPACT IS CONVERTED INTO A ROTARY MOTION, CAUSING FRAME AND FLOORING TO TURN ON A CENTRAL PIVOT

a gale of wind and roll out on the track and cause accidents.

This may seem but a simple matter to occupy the mind of an inventor, and yet the simple idea is often the most valuable when practically applied and properly exploited.

For a number of months experiments have been conducted by E. W. Tucker, of North Prairie, Wisconsin, just to invent a simplified and inexpensive brake that will prevent such accidents as the one just alluded to.

Evidently, it would not do to have a device that depends upon the thoughtfulness and memory of the men handling the trucks, for if that were all there is to the problem, simply blocking the wheels when the truck is idle would accomplish the ends desired.

In the baggage-truck designed by Mr Tucker, the handle or tongue, when not in use, is drawn up out of the way by means of a spring, so that no one will trip over the handle and space will be economized. Furthermore, as the handle rises into the upright position, this very action automatically applies the brakes and locks the truck, making it immovable.

Simply lowering the handle releases the brakes, and the truck is again ready for use. The inventor says that the brake system can be applied to the ordinary hand-truck of standard design at but a nominal cost.

THE SIMPLE-COMPOUND LOCOMOTIVE

THE compound locomotive pulling a heavy load has the disadvantage in starting that there is no exhaust steam to run the low-pressure cylinder until the high-pressure piston has made a stroke and exhausted to the low. In other words, just at the start, when the greatest power is needed, only the high cylinders are operating.

To overcome this difficulty, valves are designed to allow high-pressure steam to pass to all cylinders on starting, and afterward, when the desired speed is attained, an automatic shifting of the valves sends the exhaust steam from the high pressure to the low, and the engine runs compound. This method of operating is not new in itself, and the general idea is not patentable.

One of the difficulties in this method has been that in drifting, the suction from the low-pressure cylinder draws in cinders and other foreign matter and damages the steam-distribution valve. A check-valve of special design has been invented to remedy the trouble, and bids fair to accomplish the object in view.

Often a simple idea like this is the main difference between success and failure of an entire system of operating. The small faults that are easily overcome, when the difficulty is at last located, often bring in the rewards to the discoverer.

The story is told of a locomotive that absolutely refused to operate, and was turned over to an expert for examination and repairs. This man simply walked up to the throttle-valve and hit it with a hammer, and the engine ran perfectly ever after. The expert handed in a bill of ten cents for doing the work and fifty dollars for knowing how.

The new check-valve that keeps the cinders out is the invention of G. F. Wieseckel, of Hagerstown, Maryland. The number of the patent is 1,237,987.

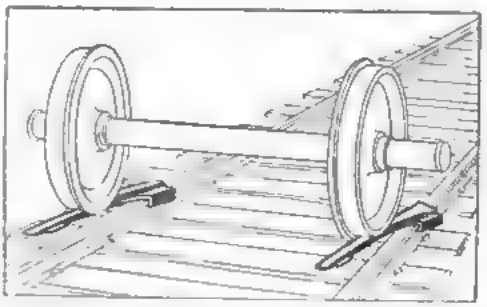
A SIMPLIFIED RERAILER.

A RERAILER of very simple construction is shown in the accompanying illustration, and, after all, it is the simple device that is the most sought after, and usually it is the most efficient. The more complicated a contrivance, the more readily it is damaged and put out of commission. Simplicity in design is the pilot-light by which every inventor should shape his course

It will be noted that the invention consists of a pair of castings, which are preferably made of steel of a high resistance. With samples constructed by the Freed Car Rerailer Company, of Quakertown, Pennsylvania, the heaviest freight and passenger cars and locomotives have been guided speedily from a derailed position on the road-bed to a proper location upon the tracks.

The method pursued is simply to place the castings with the protruding lips fitting the tread of the track and the foot of the inclined plane spiked to the rails in an immovable grip, made possible by teeth in the casting that are forced into the crosstie. Up the inclined plane thus formed the heaviest of cars and locomotives can be pulled with the minimum of difficulty

The Freed Car Company has reduced its invention to practise, and claims to be perfectly



CASTINGS ARE PLACED WITH PROTRUDING LIPS FITTING TREAD OF TRACK AND FOOT OF INCLINED PLANE SPIKED TO RAILS IN IMMOVABLE GRIP.

ready and willing to give a demonstration to any doubting Thomas with railroad affiliations who may come down the track.

TRAIN-STOPPING APPARATUS.

A NEW contribution to train-stops has been made by P. M. Sproule, of Cryville, Ontario, for which patent No. 1,237,968 has been granted him.

The general idea of this device is along beaten

paths, but carried out in a new way. A trip near the track engages a lever on a locomotive and opens a valve, bleeding the train-pipe and throwing the brakes.

The trip is operated by a semaphore and is made to slide toward the track when the semaphore arm goes to the danger position. This places the trip in line with the valve-lever on the locomotive, so that contact will occur as the train passes. Endless chains communicate the motion of the semaphore to the trip or ramp, and therefore the mechanism is entirely of a mechanical nature.

We have described quite a number of train-stops in these pages, so that you inventors may get an idea of what your fellow experimenters are thinking about, and that you may grasp their manner of applying theories to practise.

Given a theory, the mysterious ways in which it can be carried out and applied practically are vast in number and curious in kind.

Inventors who expect to devote their attention to the subject of train-stops should procure a copy of the October number of the RAILROAD MAN'S MAGAZINE, and read Mr. Frederick L. Farnsworth's article on "Mechanical Brains for Engines."

He gives the history of the subject to date, and tells just what the railroad officials want in that connection. Whether the officials will get just what they want is a question. Probably you can solve the problem, Mr. Inventor.

DON'T ASK FOR ADVICE.

THIS department does no more than describe patents already taken out, and occasionally suggest new developments. WE CAN'T PASS ON THE MERITS OF INVENTIONS, WHETHER PATENTED OR ONLY PROJECTED.

THE TROOPS ARE ON THE TRAIN.

BY C. W. DURR.

STOKE 'er up, old tallow-pot!
The Flag we love so well
With Uncle Sam is waiting
At some port we may not tell.
We dare not blow a whistle
Nor show a single light;
For it's soldier lads we're hauling,
And—the ships go out to-night.

It's soldier lads we're hauling—
Brave, bonny, bright-eyed, true,
And I hear the engine chugging,
"The Red—the White—the Blue."
I camped beneath its glory,
At San Juan hit my gait;
But a prouder man I am to-night,
Than I was in ninety-eight.

So stoke 'er up, old tallow-pot!
The Flag we love so well
With Uncle Sam is waiting
At some port we may not tell.
In all the darkened coaches,
Eager eyes are gleaming bright;
For it's soldier lads we're hauling,
And—the ships go out to-night

COLONEL VANDERBILT'S INVENTIONS.

Scion of Great Railroad House Has Patented Many Devices Used in Train Operation.

BY REMSEN CRAWFORD.

IF you had the income on about eight million dollars—let's see; the income on one million at only four per cent would mean $40,000 a year and eight times that neat little sum means about $320,000—now, honestly, if you had as much money as that pouring down your pathway of life, could anything short of hypnotism induce you to do any real work?

Would you feel that the good Lord was talking to you when He said those things about "earning thy bread in the sweat of thy brow"?

Well, young "Neely" Vanderbilt (that's what those close to him call him) has fully $8,000,000 lying around somewhere in investments, but the fellow works all the time. Just at present he is all "tied up" with the military, being colonel of the regiment which at the outbreak of the war was known as the Twenty-Second Engineers, of the New York National Guard, but before these engaging duties befell him he was working all the while, just the same.

And when he had no directors' meetings on hand, and was clear of holding conferences with the business men of the financial district of the metropolis, he could always be found bending over a draftsman's table mapping out some mechánical design, or shaping some device in his mind, which soon or late he would put into tangible shape on a blue-print.

Nearly everybody saw it in the newspapers about fifteen years ago how the old Cornelius Vanderbilt, head of the New York Central and many times a millionaire, had died and cut young Cornelius off in his will by leaving him only—mark you, I say only—$500,000 in cash and a trust estate of $1,000,000.

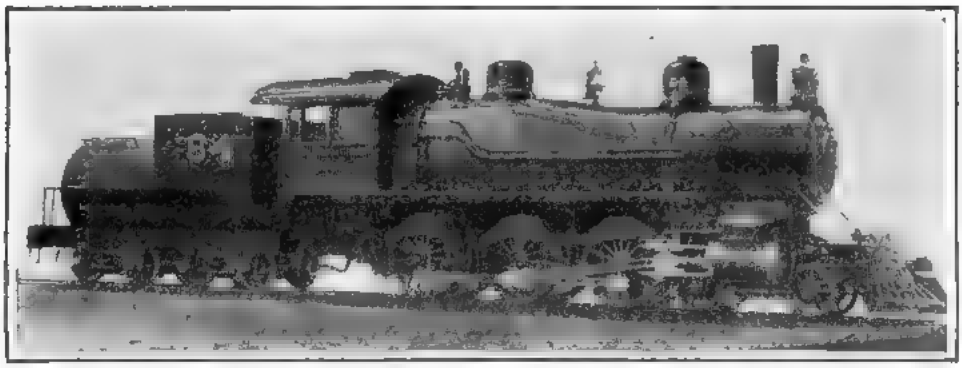
Nearly everybody will remember that the rest of the children got about $8,000,000 each—all except Alfred Gwynne, and he was made "head of the house" with a residuary estate of something like $50,000,000.

It may or may not be recalled that young Cornelius didn't kick up any fuss about not being made head of the house, but that he did demand and get about $6,000,000 more than was left to him by his father's will, and this put him on an equal basis with the other children other than Alfred Gwynne.

Now, that was the time that young Cornelius went to work, and he has been working ever since—yes, really working, not shamming. As a robust young chap just graduated from Yale, he entered the railroad shops of the New York Central and Hudson River Railroad Company at West Albany.

He did not go there as the sons of some of the big railroad captains do, just to say he had worked in the shops. He went there because he had a turn that way, meaning a fancy for such work. Cornelius really has an inventive brain, and to have the privilege of seeing the wheels go round every day in a busy railroad foundry and shop was a great enjoyment to him.

With beautiful self-effacement he buried himself among the hundreds of workmen, wearing the same kind of overalls as they wore and eating out of the same kind of a dinner-pail which they consulted so rapaciously when the noon-time whistle blew every day.



COL. VANDERBILT INVENTED THE CYLINDRICAL TENDER, WHICH CARRIES MORE FUEL AND WATER FOR ITS WEIGHT THAN DOES THE RECOGNIZED STANDARD SQUARE TENDERS.

It was while young Cornelius was at work in the shops at Albany that a friend of the Vanderbilt family and enthusiastic admirer of the young man made the prediction, "Neely is going to do something yet that will distinguish the family for a century to come."

Well, Cornelius has not yet set the world on fire, but he has invented some things which are considered by railroad men to improve the service of locomotives, and they are in use by many of the railroads of the country to-day.

After he was graduated from Yale, Cornelius Vanderbilt took a course in engineering at the Sheffield Institute, in this way indulging his fancy for things mechanical.

Went into the Shops and Really Worked.

So, with his actual experience in the railroad shops at West Albany, his general education in physics and other sciences at Yale and this special course in "Sheff," it seems natural that he should want to "reach out and lead," as Nat Goodwin used to say. And he did.

Somehow it didn't strike Cornelius that the regulation fire-box on locomotives was all that it might be. The interior bolts and fixtures seemed bunglesome and in the way.

So he invented and patented a new fire-box, differing from the standard ones chiefly in its being round, or circular. He worked on this invention for some time, shaping it so that it might be used either for coal or oil fuel, but he never could develop his desires with any degree of perfection, and this one of his early inventions, though tested for a time by the New York Central, did not "make good."

But the inventive bug which was buzzing around the young man's cap out there in the grimy shops did not go away with this failure. Young Cornelius was ambitious.

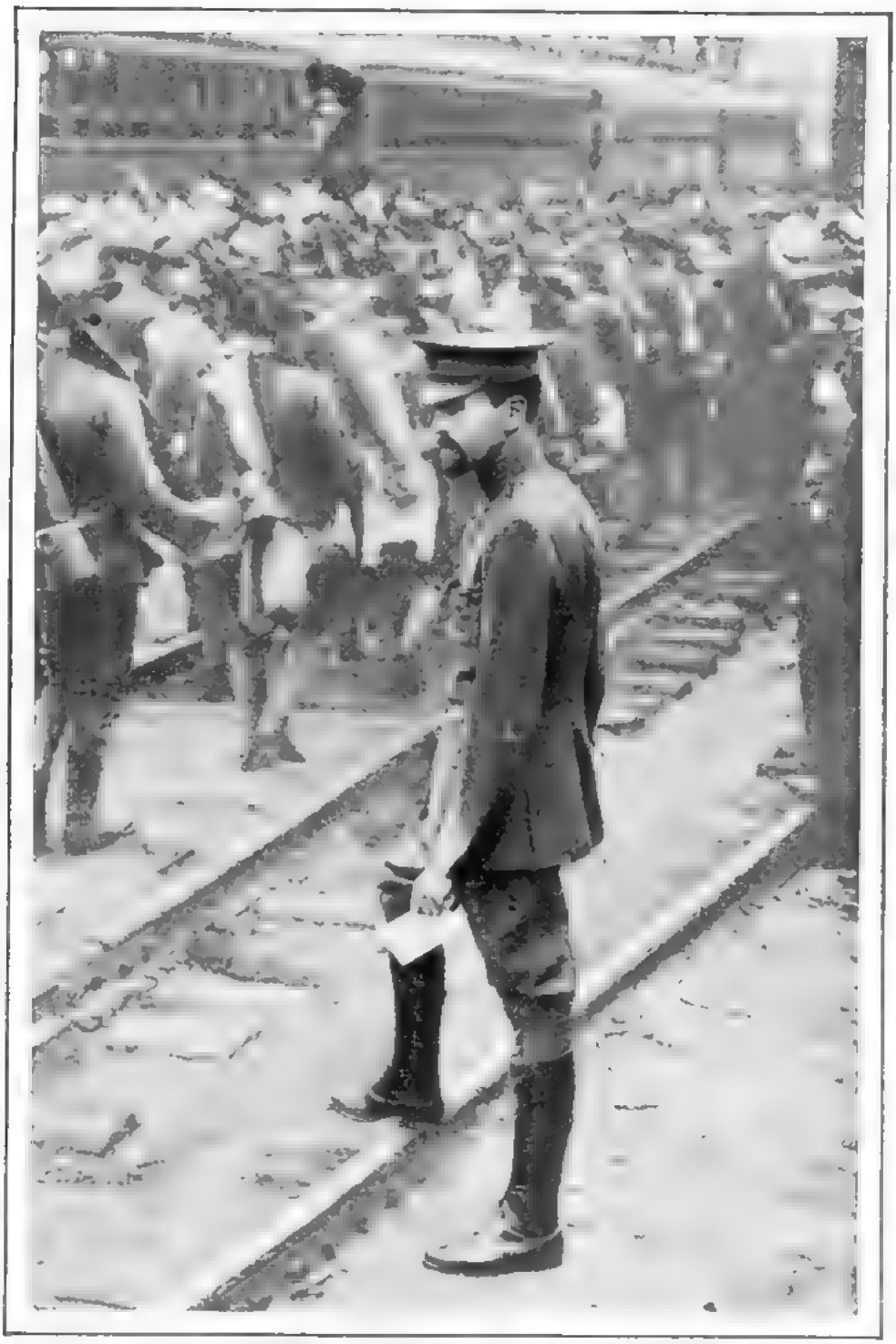
He had been put on trial before the world by the palpable snub contained in his father's will, so he kept on working at his bench, and this time brought out an idea that tank-cars, such as one sees every day on the railroads carrying oil, should have a running-board on top of them, so as to allow brakemen a smooth path in running over the roofs of long freight-trains.

He obtained a patent on this invention, but later got into litigation with the American Car and Foundry Company, suing them for alleged infringements.

Next came the invention which gave young Vanderbilt his most favorable recognition among railroad men—the cylindrical tender. It seemed to him that the recognized standard square tenders which carried the coal and water for the locomotives were too heavy, too large and clumsy.

His idea was that the same weight of coal and water might be carried with less dead weight, or that more fuel and water might be carried with the same encumbrance of "pull" on the locomotive.

To make this idea pan out young Cornelius worked day and night. He finally turned out a pattern of a tender, which was cylindrical in shape, resembling a tank stretched horizontally on a diminutive flat-car.



THOUGH COL. VANDERBILT IS OFF FOR THE WAR AT THE HEAD OF HIS REGIMENT, HIS EMPLOYEES IN NEW YORK ARE BUSILY WORKING OUT HIS RAILROAD DEVICES.

Photo copyrighted by Underwood & Underwood.

In front of this tank was a kind of bin for the coal. The benefits were twofold Not only did this new tender save dead weight, but it took up so little space behind the locomotive that the engineer could have at all times a clear view of his train, while the old style of tenders completely blocked the way behind the engineer's cab.

This has proved a success, and many of the railroads in the United States are using the Vanderbilt cylindrical tenders on their locomotives to-day, among them being the Southern Pacific, the Illinois Central and the Erie.

Things Hum in His Office.

And, so far from quitting the field of invention for the improvement of locomotives, it appears that this young millionaire has some other ideas up his sleeve.

To enter his office at No. 30 Pine Street, on the top floor of one of the big sky-scrapers in the very heart of the financial district one is at once impressed with the thought that Colonel Vanderbilt takes life far more seriously than most young men of great wealth.

There isn't a carpet anywhere in sight. There isn't a gilded sign anywhere.

Three or four men are to be seen standing beside the tall tables, such as are used by draftsmen or architects, constantly working out designs for some kind of device used in various pieces of machinery.

This work is for several operating companies in which Colonel Vanderbilt is interested. He prefers that this kind of work be done right in his private office.

Very frequently he gets busy himself and dives into great columns of figures so necessary in making an inventor's dreams come true. The railroad world may yet expect to hear from Neely with something better than his cylindrical tender.

THE UTOPIA RAILROAD.

BY HENRY I. MYERS.

I KNOW of a wonderful railway line
That runs like a lovely dream.
Its stations are spotless, its engines shine;
Its smoothness is soothing, its speed divine,
Traversing both valley and sharp incline
With neither third rail nor steam.

No fare is required to use this road,
No ticket, no fee, no tip.
The management has a peculiar code:
They're fully rewarded by joy bestowed.
The face of the president beamed and glowed
When I said I'd enjoyed my trip.

Its virtues are many, its joys galore,
This road that disdains my gold.
So sample the pleasures it holds in store,
And you'll join in its praises forever more.
Let me add that it's laid on my parlor floor,
And its owner is five years old.

SOME FREAK RAILROAD LAWS.

Latin-American Countries Are Noted for Eccentric Legislation, But They Have Nothing on Us.

BY GEORGE GOODE.

HE United States hasn't all the freak railroad laws of the world, admitting that it has enough. One instance, or perhaps a hundred, can be cited by every railroad man whose run carries him beyond the boundaries of one State. But the countries "below the Rio Grande" are noted for some of their odd laws regarding transportation companies and their employees.

They were made, not in ignorance, but in ignorance of the new transportation—the iron rail, to use a somewhat literal translation of *ferro carril* (railway).

The writer quit a position on the Tehuantepec Railway of Mexico. Through no fault of the company, perhaps, his back pay was not forthcoming as soon as he wished it.

He went to a native judge, an old gentleman whose experience with railroads dated from his sixtieth birthday. But he had the law of the land down pat.

Jugged the T. M. for Company Debt.

After hearing my tale of wo, he asked:

"You swear the railroad owes you this money?"

"*Si, señor,*" I replied, which, in the language of Kansas means, "You've got the right idea in your noodle."

He turned to an officer of the soldiers and said:

"Bring the *jefe el tren* to me."

Two hours later the trainmaster stood before the judge.

"This man, of your own country, claims you owe him ninety pesos. Is it true?"

"He has that much coming from the railroad, judge," the trainmaster replied. "Personally, however, I owe him nothing at all."

"You hired him?"

"Yes, sir"

Turning to the officer who had escorted my erstwhile superior to the office of the judge, the old gentleman said:

"Take the trainmaster to prison, and keep him there until this man has received his money. It is the law of the State of Oaxaca that a laborer's money is due when the sun goes down."

That was all; no lawyers; no long talk; no appeal. But I didn't want it that way. The trainmaster was a good fellow; a member of my lodge; and but six months before had been holding down the hind end of a passenger-train.

In case of emergency, financially, on my part, he would have carried me over his division if I flashed my card. I didn't want to see him go to a dirty prison. So I demurred.

"If the honorable judge will permit," I said in my best Spanish, "I do not want the trainmaster to go to prison. Personally, he has no more control over my wages than the meanest section laborer. He is a countryman and a fellow railroad man."

"It is the law; I have said it," the old judge replied.

Then he turned to a man sitting next to him and resumed the conversation I had interrupted.

There was but one man in town I knew who would have ninety pesos. He was the owner of the railroad eating-house. To him I appealed.

"I kicked on not getting my cash, and they've put the trainmaster in jail," I said when I had cornered him. "Lend me the ninety; I will pay myself and get him out, and then I'll return you the money."

We arranged it on that basis, and the trainmaster was released that night, after spending five hours in prison. As we went over to the eating-house to return the ninety pesos, less two, the fee of the judge, the trainmaster said:

"Why not go back to work? There's an extra with twenty cars of steamer freight coming in from Salina Cruz to-night, and if you don't take it on to Coatzocoalcos I'll have to send the west-end crew straight through, and they don't know the road on the east end."

I took the train out, and the trainmaster forgot the law of the sunset pay and the hours he spent in prison.

This law, as I found out afterward, was in force in the states of Oaxaca (pronounced Wah-hack-ah), Puebla, and some others of the southern territories. It is a relic of old Spanish days when, after each capture of a city, a division had to be made between the captors before sunset.

This was to keep any one of the invaders from sneaking off after dark with the proceeds of his loot. Legislators down there are slow to change an existing law, and it applied to the new railroads as well as to the older looters, if a judge happened to think of it.

American Swore He Was Mongol.

During the Russo-Japanese war, the government of Guatemala passed a law which prohibited the transportation of Mongolians in passenger-coaches of the Ocos Railway. This action was made necessary by the fact that some of them had become affected with a scrofulous disease which they passed to other races. The notice sent out by the superintendent of the Ocos Railway, Mr. Albert Hylton read:

> Conductors will not carry Mongolians unless they have an empty car on the train. They must not by any means be carried in passenger-coaches. The freight-car in which members of this race have been carried must be thoroughly fumigated as soon as the train arrives at the end of the run, either Pajipite or Ocos.

An American, having committed some criminal offense up the road, was sent down with a guard to Ocos. The conductor, feeling sorry for him, told him to declare himself a Mongolian. This he did.

He was put in a coffee-car with several Chinamen, who appeared to be clean and free from disease. The guards were afraid, and decided to ride in the passenger-coach the train carried. This left the prisoner free to do as he wished.

Somewhere between Ayutla and Ocos, where the road follows the line of Mexico and Guatemala, the American escaped and went into Mexico. The guards were condemned to be shot, but were pardoned on their promise to serve a term in the army.

They Knew a Law That Wasn't So.

The law regarding the punishment of a trainman in case of an accident to a native is not in force in all portions of the republic of Mexico, as many think from newspaper and magazine articles.

It has never been enforced below the City of Mexico, and just before the first revolution it was inoperative in many of the northern states. This fact led to a queer experience of two railroad men, one of whom, Harry Baldwin, is now holding an executive position on the Iquiqui Railway in South America. At that time he was conductor of a train on the Vera Cruz and Pacific, between Perez and Santa Lucretia.

He was called to take a light engine from Perez to Santa Lucretia. His crew consisted of a native brakeman, ditto fireman, and an American engineer.

Both Baldwin and the engineer were new men on the V. C. and P., and were unfamiliar with the laws in force there. While running ahead to head in at a siding, the native brakeman fell and was run over and cut to pieces.

As was customary in northern Mexico, the engineer and the conductor put the engine in "the hole," killed the fire, and vanished. Consternation was felt for their safety, as the country was swampy and full of dangerous animals and reptiles.

Towns were few and far between, and the inhabitants were Indians, who could not give a man directions to find a place ten miles from their village—they never traveled that far from home.

Came Out Almost Where They Went In.

Three weeks from the day they put their engine on the siding and skipped out, they appeared at a station hardly ten kilometers from the one where the accident occurred. Their clothes in shreds, their bodies covered with insect-bites, half starved, they went into the town and saw a train pull in.

They thought they were near the coast, and were astonished when they saw a V. C. and P. engine they knew at the head of the train. In despair they went over to get some food, regardless of what they thought would become of them in a Mexican prison.

"You fellows from the north have the wrong idea about things down here," said one of the crew of the train, as they watched the two hungry Americans eat their first good meal in twenty-one days. "When you get fixed up, go back to that place; go to the *jefe politico* (mayor), and make affidavit as to how the accident occurred. You will be released on your own recognizance, and that will be the last you will hear of the case."

Thief Queered R. R. Game for Yankees.

When the Guatemala Central connected with the Occidente Railway at Mazaltenango there were great ceremonies. A tie, covered with one-eighth inch of pure silver, was placed where the roads connected their rails, and the silver spikes fastening the rails to the tie were driven by the president of the republic, Señor Emanuel Cabrera.

After the ceremonies, which occurred late in the evening, when the sun was cooling, the party went to a hotel for a banquet. Next morning the silver tie and the silver spikes were gone. So was an American, an employee of the Occidente Railway.

Since that day, in the provinces of Mazaltenango and Retalulahua no Americans can be employed on any railway, because of the insult to the governors of the two states and the reflected insult on the president of the republic.

San Felipe, where the Occidente shops are located, is in the latter province, which is too much like the alphabet after it had been through a Kansas cyclone to rewrite here, and it is no curiosity to see a man whose name on the pay-roll is Peña Saltarte, answer when called by the name of Jones, and one American engineer whose name is Baxter is known on the pay-roll as Parentius Gabaracondito.

"Gabaracondito" was hired on the Occidente, and while waiting for an examination took a walk out to an old ruins, and said he got the name from many inscribed on an old wall.

Had to Pave between the Rails.

In Sunsanata, Salvador, a little railroad runs from the port of that name up to the hills. By Americans the name of the town is pronounced like that city in Ohio made famous by Garry Herman and the baseball team which usually ends the season second or third from the bottom of the list.

This road was poorly surfaced, and there was no path along the center of the track, as there is in many Central American roads. Down there a railroad track is regarded as a public highway by the natives. Somewhat like parts of the United States in that respect.

One day a cruiser, flying the flag of a big European power, came into port and fired a shot or two. There was no cause for the exodus, as the republic was not at war with the power; but every man, woman, and child in the little town left their homes and ran up the railroad track and sought safety in the jungle.

It developed afterward that the cruiser was making a friendly visit. The officers when they landed were welcomed only by three Americans in dirty overalls.

But out of the incident came a law. During the run to the jungle one of the officials of the town had stumbled when his foot stuck between two ties. His nose was badly bent, and his face looked like that of a man who had shaved while he had delirium tremens.

Duly promulgated, the law came out that after a certain date all railroads had to

maintain smooth walks between the rails. So now, should the inhabitants of Sunsanata become frightened at anything, they have a nice path on which to run.

Where Mr. James Crow Makes Trouble.

But the United States has one of the most freakish laws in existence. In a portion of the South a railroad runs through a corner of a State for about ten miles. It maintains two stations within the State.

This State has a "Jim Crow" law, which segregates persons of African descent from whites. Just before reaching that ten miles of track the train-crews have to see that the races are in different cars; that signs, "This Car for Whites" and "This Car for Negroes," are placed at each corner of the cars, and after the ten miles have been operated over, the signs have to be taken off and the races can segregate themselves or not, as they like. On a train of ten or twelve cars the work is anything but easy, but it must be done, and at the State line. So the grand old United States beats them all, even in freak laws.

THEY ALL DO IT.

BY ROBERT D. LUKENS.

THE despatcher tore his hair and howled:
"This railroad game is a sin;
The best you can get is the worst of it,
And you're loser if you win.

"To-day is my last. I'm going to quit.
This grind would drive one to drink;
I'm going to get me a job somewhere
That doesn't require me to think.

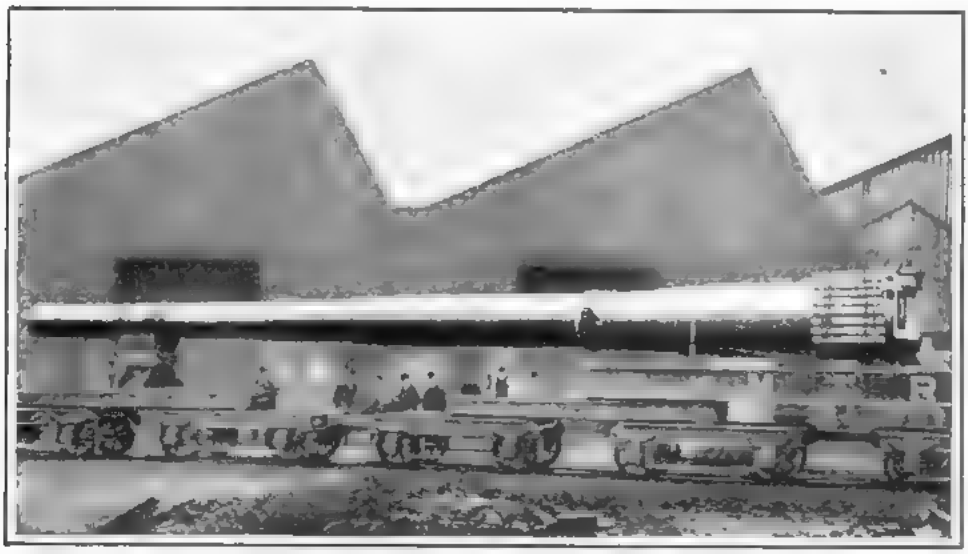
"I've figured meets till I'm black in the face—
I've kept them moving till, now,
An extra west jims the whole darned works
By running over a cow.

"To stop his train after hitting the brute
Was nothing short of a crime,
For he knew full well he was laying out
Three trains which were then on time.

"I'm going to quit. My brain's on the blink;
My nerves are ragged and drawn;
I'm going to look for a job on a farm,
Where brains take siding for brawn."

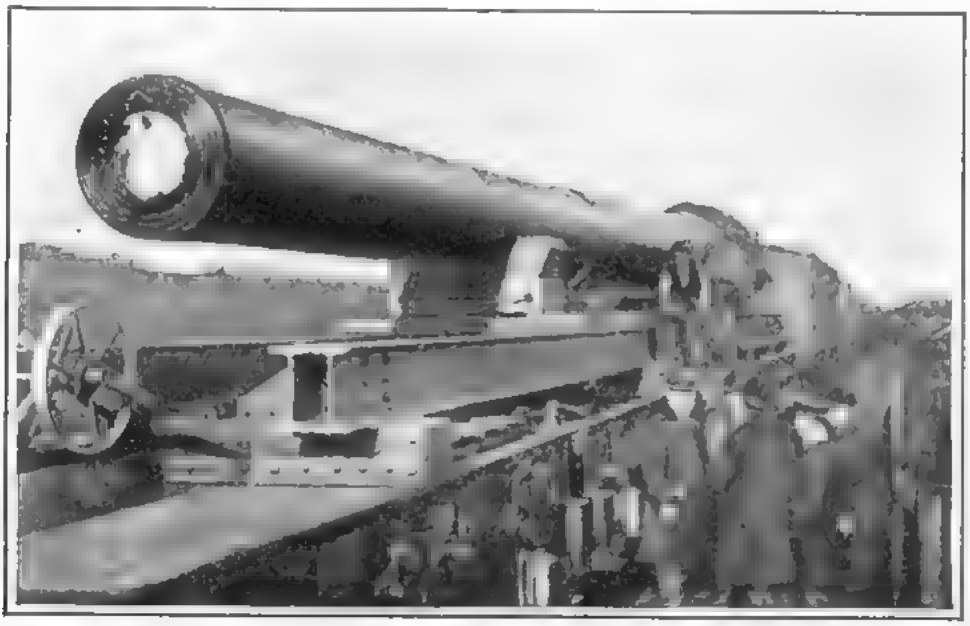
Ah, no, dear reader; he didn't resign—
He's been too long in the game.
He raves each time that a train falls down—
But he'll die at his key just the same.

FIVE CARS USED TO CARRY ONE GUN.

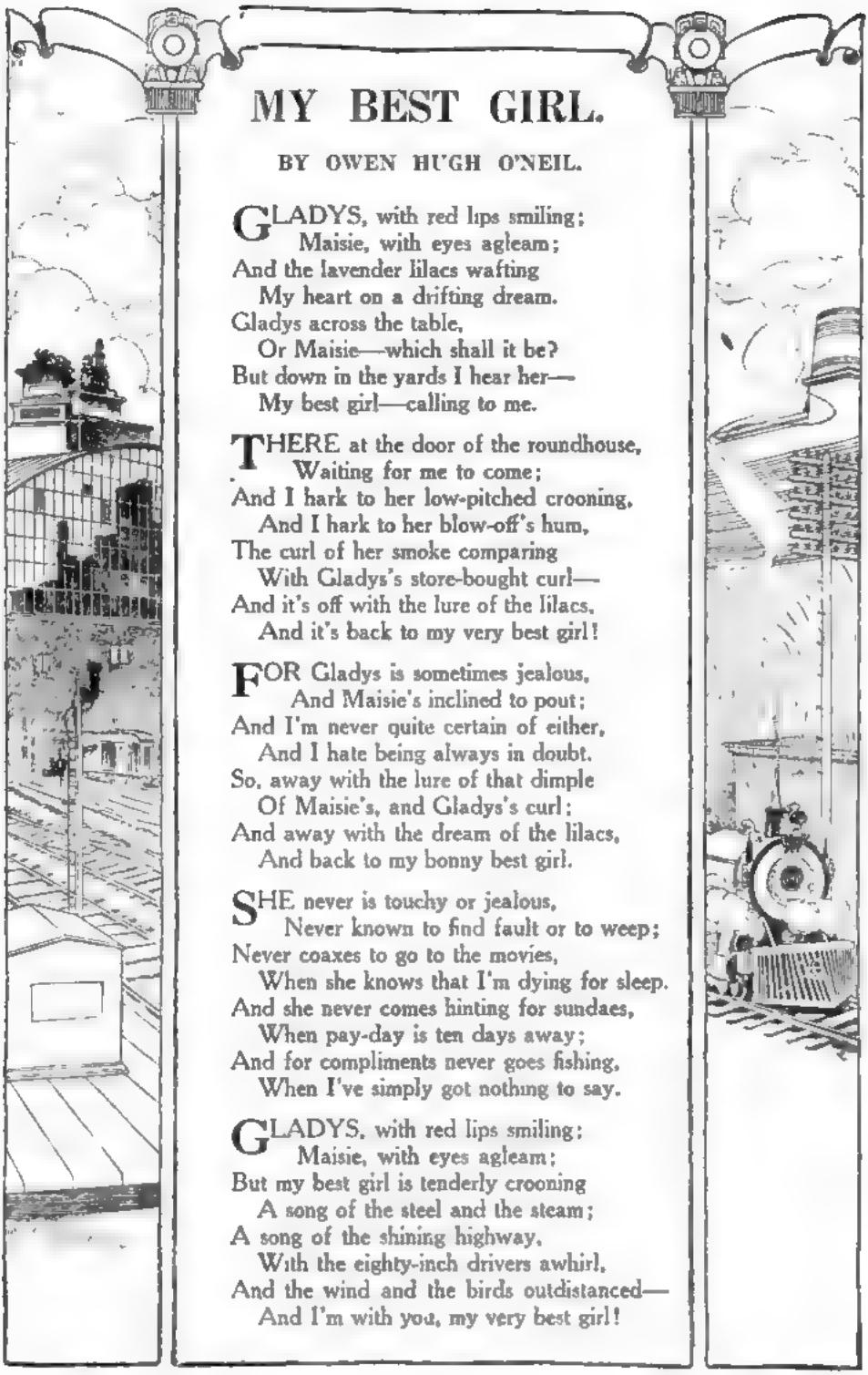


LARGE BRITISH NAVAL GUNS MOUNTED FOR SHIPMENT BY RAIL ON SPECIALLY BUILT FOUR-WHEEL TRUCKS USED BY THE MIDLAND RAILWAY

WITH the new phases of development in modern warfare the railroads face a great many new problems in transportation. One of these is providing cars to carry the mammoth steel guns which the great war has produced. While the manufacturers are still in the experimental stage, the flat four and six wheel trucks, supported by heavy steel I-beams, now in extensive use, have been found to render highly satisfactory service in the cause of the Allies.



ON THE LONDON AND NORTH WESTERN RAILWAY THE SIX-WHEEL TRUCK IS IN COMMON USE FOR SHIPPING THESE MONSTER CANNON



MY BEST GIRL.

BY OWEN HUGH O'NEIL.

GLADYS, with red lips smiling;
Maisie, with eyes agleam;
And the lavender lilacs wafting
My heart on a drifting dream.
Gladys across the table,
Or Maisie—which shall it be?
But down in the yards I hear her—
My best girl—calling to me.

THERE at the door of the roundhouse,
Waiting for me to come;
And I hark to her low-pitched crooning,
And I hark to her blow-off's hum,
The curl of her smoke comparing
With Gladys's store-bought curl—
And it's off with the lure of the lilacs,
And it's back to my very best girl!

FOR Gladys is sometimes jealous,
And Maisie's inclined to pout;
And I'm never quite certain of either,
And I hate being always in doubt.
So, away with the lure of that dimple
Of Maisie's, and Gladys's curl;
And away with the dream of the lilacs,
And back to my bonny best girl.

SHE never is touchy or jealous,
Never known to find fault or to weep;
Never coaxes to go to the movies,
When she knows that I'm dying for sleep.
And she never comes hinting for sundaes,
When pay-day is ten days away;
And for compliments never goes fishing,
When I've simply got nothing to say.

GLADYS, with red lips smiling;
Maisie, with eyes agleam;
But my best girl is tenderly crooning
A song of the steel and the steam;
A song of the shining highway,
With the eighty-inch drivers awhirl,
And the wind and the birds outdistanced—
And I'm with you, my very best girl!

TRIPPING DOWN THE OLD MISSISSIP'.

BY RAYMOND S. SPEARS.

The Disappearance of Jerry Fander Stirs Up Excitement in Pittsburgh and Points South.

A SIX-PART STORY—PART FOUR.

SYNOPSIS OF PREVIOUS CHAPTERS.

JERRY FANDER, of Pittsburgh, orphaned heir to millions, takes a motor-boat trip down the Mississippi, in the course of which he proves of service to Tressy Wooten, a shanty-boat girl. He is kidnaped by Dan Delp and Chub Muldy, river rats, who also steal his boat, the Fairy Land. Fander makes a deal with the rats, whereby he is to get one hundred thousand dollars' ransom from the miserly administrators of his father's estate. Of this sum the kidnapers are to get sixty thousand dollars and he is to keep forty thousand. If the administrators won't give up, the rats threaten to kill young Fander.

The trustees are using the Fander estate to develop the Swamp, Delta and Bayou Railroad to their profit, and naturally don't want the heir around. They put out the story that Jerry is serving a jail term under an *alias*, offer a reward to any one who can locate him, and hire Detective Shadder to engage in an ostentatious chase. Fred Walts, a Pittsburgh reporter, writes a newspaper story which gives an inkling of what the trustees are up to.

The story falls into Fander's hands; he immediately writes Walts to trip down to the rescue. Walts buys a motor-boat and starts.

Meantime Fander has cut through the manacle that bound him, and is ready for escape.

CHAPTER XVI.

QUIET TIMES FOR HIST'RY FELLERS.

"I'M a newspaper man," Walts explained to curious people as he dropped down-stream. "I was sent down here to write a series of articles about the Mississippi River. I'm from Pittsburgh. My name is Walts. I am on my way to Montgomery Chute, mouth of White River and Arkansas Old Mouth."

And in saying this he was telling the exact truth.

Walts had camped out for two weeks on his vacations. He had run a motor-boat on a little lake. He had hunted squirrels and partridges. He had been in woods a mile across, which he regarded as a tremendous wilderness.

In all his experience, however, Walts had never seen such a country as the Mississippi River ran through, nor had he ever enjoyed such wild life as now he entered upon. He had been brought up to unload his firearms when in a boat or in camp, but now, after he had had flocks of ducks sweep down overhead, forty feet up, he loaded his shotgun.

As he dropped along by shanty-boats, with whose occupants he passed the time of day, and to whom he told his business, he took to keeping his automatic pistol loaded and under his pillow. More dangerous-looking people he never had seen in all his life.

Walts did not go fast. He had to feel his way down the river, so to speak. Boats passed him repeatedly.

He ran into Montgomery Chute, and remained there two days, spending most of the time talking to Mrs. Dipney, the storekeeper, who told him things about the Mississippi of which he had never dreamed—stories and gossip and incidents.

From there he passed down White River, through the mouth and saw not a sight of humanity there; no cabin-boat, no tent, no skiff-marks in the sand.

It was a terribly lonesome place, with woods behind sandbars that stretched away like deserts. Wild geese were at the foot of the bars, and ducks were swimming in the eddies below.

On the bars were tracks of many animals, cattle, hogs, raccoons, opossums and the long-legged steps of deer and bear. He saw, half a mile away, a flock of wild turkeys; and skulking in some switch willows growing on a new bar, he saw a wild cat, which he shot with a twenty-five caliber bullet.

Miles and miles of such incidents; then suddenly— "I hearn yo' was comin' down," a shanty-boat greeted him in the eddy two miles above Arkansas Old Mouth. "Yassuh; I jes' knowed yo'd be drappin' in yeah, too. Mostly fellers does drap in yeah. I'm friendly. I neveh harm no man. But I got a gun, case any man should harm me!"

He drew and displayed a forty-five caliber revolver that would weigh not less than three pounds and a half.

"They's not much on Old Mississippi these days," the shanty-boater went on. "Steamboo's is most all gone. Loggin' ain't like hit uset to was. They ain't one shanty-boat now where they was ten fifteen years ago.

"Them days, yo'd learnt int'restin' things to write about, on that er machine of yourn. Them days, if yo' wa'n't killin' somebody yo' was gittin' killed, yo' mout say.

"An' they said then, some of the old-timers, that times was dull, 'cordin' to what they was away back yonder, to'd war times. Them old days, they was bo'ts come down this old river with whisky-stills abo'd an' they'd make moonshine fo' yo' while yo' waited; yassuh. But the dad-blasted gov'ment ruinated them times.

"I've seen, in my time, five hundred shanty-boats into one eddy, an' agin yo'd see a long bend 'thout a soul into hit. Yo' could have comp'ny, er yo' could trip hit alone, an' mind yo' own business.

"They ain't no 'citement these days. Shucks! Hit's daid; hit's so danged daid down thisaway that the buzzards has et hit up, yassuh!"

"I heard that a man name of Jerry Fander had disappeared down here?" Walts ventured to ask.

"Oh, yes—mos' likely he's got killed. They's some killin's down heah yet—rough fellers an' them kind.

"Yo' know, theh's rough fellers all over. They does killin's some when they thinks they ain't nobody lookin'.

"But hit ain't like hit used to be in the old days, not by a long shot. Them days gentlemen did killin'! Hit wa'n't no lonesome bend, er midnight throat-cuttin'! No, suh! Hit were git right on Main Street an' shoot the livin' daylights through one another, like gemmen.

"They don't do hit thataway no mo'. No, suh.

"I tell yo', the good old days is gone off Old Mississip'. Yo' come down yeah too late, young feller, to git what yo'd call real hist'ries. They ain't no genuine, high-toned killin's down yeah, no more. Hit's mostly jes' kind of yeller spo'ts comes down yeah, an' they's astin' along is hit ag'in' the law to tote guns in this State?

"Think of hit! Astin' permission to tote a gun! Why—oh, shucks! What is the uset of talkin'? They ain't no uset; no, suh!"

Walts, wondering whether he was hearing aright, listened. He had never before heard such real, genuine regretting the good old days.

He dropped down the river a mile and then stopped in a little eddy to post up his notes, and write down as much as he could remember of what he had heard. It would give a fine local color to his story of Jerry Fander, if he could find Jerry, or Jerry's friend.

Having written his notes, he headed downstream; and, discovering the narrow waterway out of the woods, he turned into it. There along the bank were moored many shanty-boats and motor-boats. He knew, without being told, that this was Arkansas Old Mouth, most famous of Mississippi River shanty-boat towns.

He steered up the Old Mouth slowly, looking at the boats and returning the greetings of the people along the bank. There were men, women and children—river pirates and river missionaries, photograph artists and store-boats, junkers and fishermen, trappers and umbrella menders, sports and whisky-boaters. His arrival gave a literary flavor to Arkansas Old Mouth, especially as he had a typewriter screwed fast to a board where he could write on it as he sat at the wheel of his motor-boat.

He ran in at the upper end of the town. As his boat came to the bank an agile little man came running down and caught the mooring-line.

"Howdy!" he greeted as Walts came ashore. "I'll make hit fast yeah to this stake. But we wont stay yeah long, suh; jes' so's we can kind of git to know each otheh, suh. Hit shore done my heart good when I hearn yo'd drapped out of Helena; yassuh."

"What—I—my name is Walts—Fred Walts. I'm a newspaper reporter."

"Yassuh," the little river man assured him. "I knowed hit."

The little man glanced down the bank and

saw that the nearest observer was some rods distant before he whispered:

"Yassuh, Jerry 'll shore be glad to know yo' ain't went back on to him. He's shore up ag'in' hit, yassuh. But we's friendly to'd him. We ain't no hard, mean feelin's. 'Course, business is business."

"Of course," Walts admitted.

"He'll be glad to see yo' an' talk hit oveh."

"I'll be very glad to see him!" Walts exclaimed heartily.

"Yassuh. 'Course, yo' got to mind yo' own business!"

"Why, yes; certainly!"

"I 'lowed yo' would. Hit's one trouble, down Old Mississip'—lots comes down yeah that don't mind their own business. Take a man that minds his own business, an' he's all right."

"I've found the people very decent to a stranger—"

"Yassuh, soft-paws is always took care of right, if they's on'y cyarful to mind their own business. Trouble with soft-paws is, they's iggerent. They ain't no sense. No, suh.

"Well jes' kind of hang around yeah a while, an' come night me 'n' yo'll pull out. Don't say much about what yo's hyar fo'. Yo' shore come right to headquarters, suh!"

The little man drew away as other river people came along and eyed the stranger curiously. Walts was in a bicycle suit, and looked very, very neat among that crowd.

He had learned how to talk to river people, however; so, answering a civil greeting from a man, he proceeded to tell who he was and where he was from, and explain that he was down the river, having been sent by his newspaper, to tell the world just what a beautiful country it was down there, and describe the lovely, idyllic lives led by the cabin-boaters between the levees.

"Yassuh, they ain't no betteh place to live in the world than right down yeah," his hearer assented. "Take hit from Cairo to 'Chaffelli, an' hit's plumb comfort. I ain't no likin fo' the coast, though. Hit's mean from round Plaquemine to N'Orleans. Theh's mean people on the riveh down thataway."

"Yassuh," another chimed in. "I was held up down theh by that N'Orleans tug-boat gang. They took two hundred dollars off'n me. Yo' know them—the Polohe brothers?"

"Yassuh, an' yo' was lucky they didn't sink yo' in the riveh, too. I tell yo', times ain't like they used to be in them old days. Then days, they wa'n't so much triflin' meanness goin' on.

"Them days, if they robbed yo', they killed yo' an' that was the end of hit, but now—sho! Hit's jes' triflin' robbin' an' stealin' fish, an' lonesome bend killin's. Times shore ain't like they used to was! No, suh!

"They shore ain't; no, suh! Them days yo' could of found real hist'ries; but now they ain't nothin' but gov'ment levees bein' busted by overflows to write about, an' relief work in the bottoms, an' so on.

"That's all, suh. Too bad yo' couldn't of knowed Old Powder-Eye an' Cut-Throat Lily-Lu, an' them kind. My! But Lily-Lu could of told yo' his'tries, if she wa'n't mad er nothin'. Lily-Lu was a real lady, nice as anybody; but she had an' awful temper.

"She always treated me real nice; 'course, I neveh said nothin' to 'fend her. She was proud an' high-spirited, but lots didn't understand that.

"If yo' understand a lady an' treat her right, she'll treat yo' right. That's the way hit was with Lily-Lu. She neveh hurt any man, if he on'y didn't hurt her feelin's er anything. She was awful sensitive, Lily-Lu was.

"But, ho law! When she took to rearin' she jumped a mile an' tore up what she lit on; yas, she did, indeed!

"Hit's seo! I've hearn tell when she busted her moorin'-lines she'd leave a line o' busted haids an' laid-out people on both sides of her fer half a mile! Now, if yo'd on'y got to see her, yo'd had somethin' to write about."

"Where is she now?" Walts asked.

"Oh, she's moved up the bank. She lives up back from Vicksburg somewheres. She ain't a river lady no more. She's settled down, and married so she stays married.

"I guess her man kind of got worried about her on the riveh, an' he 'lowed he'd betteh move up the bank.

"You'd neveh know, now, to look at Lily-Lu, that she was such a rip-snortin' little gal. She wa'n't bad, yo understand—she were jes' mean, that's all.

"She married real well two-three times, but I don't know, somehow she didn't seem to get along very good. I s'pose hit were jes' her way of showin' her dis'pointment, her knockin' her husbands ovehbo'rd, an' workin' her trigger-finger so sassy an' quick. She wa'n't afraid of nobody; she'd jes' soon shoot a sheriff er mayor as anybody."

"I'm sure I would like to have talked to her," Walts agreed.

"Yes, she could give yo' hist'ries! But, my lan'! A man took awful chances, talkin' to her, er gittin' married to her. I've heard

say that the last two-three times she married, the fellers wa'n't so overly anxious to, but they 'lowed they'd betteh, jes' so's she wouldn't feel insulted.

"Then afteh the ceremony she'd be real nice fo' eveh so long. But she was awful quick; they wa'n't the matter with Lily-Lu, but she was quick. Yo' take a lady that's got a temper, an' they's that way, more or less. A husband, he jes' don't know which way he's goin' to git ketched by that kind, nuther."

"Then there aren't any ladies of her kind on the river now?" Walts asked gravely.

"Well, no; not exactly. Yo' see, times is changed some. Them days, if a lady was on the riveh, she jes' had to git married. She needed a man to pertect her.

"Now, mostly them ladies is widows. Yo' don't hyar so much about 'em. Yo' see, a widow can took cyar of herse'f now.

"Hit's jes' as I said. They ain't no hist'ries on Old Mississip' any mo'! Hit's real quiet an' peaceable.

"Ladies ain't mean when they's let alone. Nobody bothers widows now. Take ladies like Lily-Lu an' they's jes' naturally widows er old maids. They couldn't stand havin' men around, an' they jes' naturally busted 'em oveh the haid when they got peevish. That's all.

"If ladies had to be married down Old Mississip', the way they used to have to, fer pertection, why they'd be hist'ries down thisaway. But they don't have to, so they ain't the ructions an' husbands overbo'rd, like they used to was.

"Why, I've seen three husbands into one eddy to once, an' their wives a tryin' to hit 'em with dishes er sunthin'. That was right yeah into Arkansas Old Mouth."

"Yassuh," a cold female voice interrupted. "And one of them was my husband, Bill Hupper. Yo' got anythin' mo' to say, suh?"

"Why, Mrs. Wooten—I—no, mum! I—yo' see—I was jes' sayin'—"

"Yo' said 'nough, Bill Hupper!"

The spokesman backed away, blinking, and the spectators assumed that impersonal, uninterested, I-mind-my-own-business expression so familiar upon occasions of personal difficulty.

Mrs. Wooten observed Bill Hupper fading up the bank toward the woods till he was out of sight. Then she delivered a pronunciamento:

"They's too much talk down yeah; if people kept their mouths shut an' minded their own business hit'd be plumb peaceable. Don't yo' pay no 'tention to what them fellers say about widow ladies, young feller."

"Certainly not," Walts replied. "What I'm after is facts."

"Yo'll git lots of news that ain't so down Old Mississip'. Now yo' take hit about my man bein' in the riveh. He was shiftless, no 'count, trifilin'.

"Jes' natur'ly, when a lady's married to a man like that, she has to bust him on the haid, er sunthin'. Yo' can understand how that is, same as sometimes a man has to beat up his wife, if she ain't what she'd ought to be. Sometimes the man's no 'count, an' sometimes hits the woman.

"I'll admit that about some ladies. They just needs beatin' up, er they won't tend to their share of the teamwork. But I don't b'lieve in beatin' nobody up that don't need hit.

"I neveh was married but twicet, an' ain't had no experience, yo' mout say, 'side of some riveh ladies; I jes' couldn't stand bein' married, not to the bestest man in the world. Hit takes mo' patience an' good nature an' payin' no 'tention to things than I got er ever would have. So don't yo' go an' git the wrong idee into the paper about that."

"No, ma'am," Walts assured her.

"Yo' better not, if yo's comin' back down Old Mississip' agin! Hit's peaceable down yeah, an' quiet, an' hardly any killin's er hold-ups, er that kind, but folks is high-spirited an' they won't stand fo' everything; no, suh."

"No, suh," listeners echoed.

"I shall take great pains to get things just the way they ought to be," Walts assured them.

"Some things ain't wuth talkin' about," she added.

"Lots and lots of them!" Walts agreed.

Walts observed a girlish young woman who came and slipped her arm around the lady who was talking. This young woman had red hair, a freckled face and perfectly beautiful eyes.

It seemed to Walts that he had never seen just such eyes in all his life. There was a faint smile on the young woman's lips, and a very bright, shining laugh in her eyes.

However, she bore considerable resemblance to the older lady, so Walts did not stare at the girlish one for any length of time—no longer than to obtain a quite comprehensive number of points, so to speak, as to the young woman's appearance.

Walts was invited in to supper by one of

the shanty-boaters, and he accepted. Two or three others came in, too, to dine.

Inside, the reporter found himself facing a whole-roasted wild turkey gobbler. The bird had been stuffed with a sage-onion dressing, packed in a thick coating of clay mud and put into a deep hole, the bottom of which held about a bushel of red-hot hardwood coals. On top of the clay case had been heaped about a barrelful of red-hot coals, and then the roast-pit was covered over and packed with dirt.

When the clay case was taken out, after ten hours' roasting, the feathers and skin fell away with the caked clay. This left the meat of the bird just ready to fall to pieces upon a great platter.

By every plate were three hot biscuits on a little dish, and in a large soup tureen was a gallon of flour gravy, flavored with four or five fox squirrels and a duck or two, for richness.

The shanty-boater slewed off about a pound of the gobbler, ladled up almost a pint of gravy on a soup-plate, served a cupful of dressing, and passed it around. As it was a twenty-four-pound bird, dressed, each diner had to eat about three pounds of the meat, white, brown or yellow.

"I don't believe I ever knew what a real turkey tasted like!" Walts exclaimed after a while. "I almost wish I was like a cow, and had four stomachs!"

"Hi—hue-e!" the others shouted with glee, the host continuing, "I jes' knowed yo' was a good feller, an' could talk if yo got a goin'—yassuh!"

After supper, and quite early—about eight o'clock—the guests withdrew toward their respective boats. Walts had told his little story of coming down the "riveh," and gave details of places where he had landed and whom he had talked to, and what they had said, and so had established himself very well with the company. As he strolled in the gloom toward his boat—alone, for the other guests had come from the other direction, as it happened—a voice spoke low but clear at his elbow:

"Now, Mr. Man, I 'lowed yo'd talk to me, won't yo'? My name is Tressy Wooten, an' that lady yo' talked to this evenin' is my maw. I ain't neveh had no good chanst to talk to a city feller, 'ceptin' one. That was a feller name of Fander, jes' a while ago."

"You talked to Jerry Fander?" Walts exclaimed.

"Yassuh—sh! Not so loud! Let's git back in the brake, suh!"

She led him back from the river-bank, and a hundred yards away, where they could just see an occasional yellow flicker of a cabin-boat light, they sat down on a log.

"Maw neveh let me talk to no fellers," the girl said with engaging frankness. "But, shucks! She was sparkin an co'tin' around when she was three-fo' years younger'n I am, an' I jes' 'lowed I'd talk to fellers, too. But if maw should heah tell, ho law! I bet she'd skin yo', I bet she would!"

"Probably she would!" Walts admitted. "What did you and Jerry Fander talk about?"

"Oh, lots of things. About Mississippi gove'ment reports—"

"You've read them?" Walts exclaimed.

"I got all them reports for nine years—"

"So have I. Wonderful work the government is doing down here!"

"Some of hit, yassuh. But they's drudged an' drudged an hit ain't no 'count, spendin' money thataway. No steamboat uses the channels they drudge thataway.

"An' 'sides that, we talked about motor-boats, an' engines, an' he towed me from ten mile below Rosedale to White Riveh Mouth He filled up my gasoline tank, too—I'd run short of gasoline.

"I went back next mornin', 'lowing' I'd talk to him some more, but two fellers took hisns bo't an' went down the riveh with hit. I seen 'em, but I didn't know what was up."

"In the daytime!"

"Yassuh, about nine-ten o'clock in the mornin', suh. I know one of them fellers, too—he's right here, too—that feller tied yo' in this evenin' when yo' come in. Delp—Dan Delp's his'ns name. But don't yo' let on I told yo'!

"Yo' see, I want yo' to he'p me git that feller, an' me 'n' yo'll split the thousand dollars' reward. Understand?"

"Eh—why—"

"Yassuh! They got him back in them bayous, suh. I know what yo's afteh. Yo's cute, yo' is, pertendin' to be a writin' hist'ry feller. But, shucks! Yo's a detector, an I know hit! Now, yo' 'n' me 'll work—"

From toward the river came a sudden shrill cry in the dark:

"Tressy! Tres-s-s-y-y-y!"

"That's me!" the girl whispered, leaping to her feet. "I got to run like blazes an' lie like a chicken thief, er she'll think sunthin! Lawse! I bet she'd blow yo' haid off if she knowed you'd set here by me on this log—s'long!"

Walts gasped as she fled in the direction of the cry. He followed, but diverged from the

straight path, to hit his own boat-landing. He wondered if the mother would suspect anything? Also, he was surprised to have the girl pick him for her partner in her enterprise of obtaining the reward for the return of Jerry Fander.

He was very much complimented, too, and he fully realized that the girl could have picked no better partner for her enterprise.

As he started to go down the bank to his boat, for the second time that evening a voice arrested him.

"Sho!" the voice, a tenorish male, whispered. "Yo' betteh look out er old Mrs. Wooten 'll jes' natur'lly fill yo' full of buckshot, yassuh! Hit's all right to-night! yo' made yo' getaway. If I didn't know, I'd b'lieved the same as Tressy done, that yo' was a detector, but yo' ain't. I had a feller watch yo' boat. Me 'n' yo'll go see Jerry Fander, suh! Come on!"

CHAPTER XVII.

JERRY DEVELOPS A PUNCH.

IT was just before daylight that Jerry Fander awakened after he had said to himself that all he needed was a chance to get away. He had a feeling of liberty which he had not enjoyed in a long while. He stretched without being conscious of his chain. He sat up with a start.

His chain no longer bound him!

It was the most dismaying of his experiences in many a day. The cut which he had made in the chain had been too deep, and the thin tin of remaining metal had in some way caught a strain, twisted off and there he was free!

It was positively shocking. He felt himself in a panic. He was frightened for fear Chub Mildy might discover that his chain no longer held him. He could not think what might happen then.

All his life Jerry had felt himself dependent upon some one. He had never been clear of strings and bounds. He had struggled against the bounds, it is true, but he had never really freed himself from them.

The chain that bound him to his own motorboat cabin had been a physical counterpart of his mental relation to his executors, or a tutor, or to his income. His trip down the Mississippi had been a kind of effort to escape a dimly known thraldom.

Had he been a man of independent resource and action, long since his captivity on the Fairy Land would have become unendurable. He had accepted it, just as he had accepted the swaddling-clothes of his babyhood, the toddling-chair of his early efforts to walk, the discipline of his school-teachers, and the guidance of his tutors.

He had never been free from the day he was born. He had ranged far, but never had he escaped from his tetherings, except theoretically.

Had he been thrown suddenly upon his own resources he could not have been more astonished, more startled, less ready for it than now, when he found the iron chain of his manacle parted at its connection with the anchor-chain.

He was obliged to think now, for he knew that shortly Chub would be stirring to get breakfast, and that it would be no later than his getting up to dress himself that Chub would observe the severed chain. Having decided that this was inevitable, Fander rose from his fears and set his jaws for independent and decisive action.

His independent faculties were well-nigh atrophied. He found that he could think only with the utmost difficulty upon the subject that now demanded clear and precise action. It dawned on him that he was meeting a perfectly free man, with the advantage of a lifetime of independent action behind him.

"I don't know what to do—I never dreamed of such a thing!" Jerry said to himself. "I thought of getting away—but I can't get away! I don't know how to leave this dark corner! I just must—"

Jerry felt Chub stirring in his bunk. Dawn was at hand. The hour, the minute for action had arrived, and Jerry was still unprepared, still with his mind wandering and undecided.

Chub bobbed up, dressed himself and stepped out into the open cabin. Jerry was in the next bunkroom. The door was open. The chain led across the floor from the hog-chain to the bunk. Chub glanced in, in the dim dawn light, and saw Jerry lying there, as if asleep.

Rapidly daylight filled the cabin, and the dishes began to rattle as Chub swiftly prepared the morning meal. The coffee odor began to fill the cabin, the splutter of homemade sausage in the hot pan baited the appetite, and Chub slapped the dishes around on the table.

"Time to get out, an' wake up!" Chub called.

"All right!" Jerry answered, crawling out with the chain rattling in his hand.

He began to dress himself, and he was all dressed when Chub came to the doorway of the bunkroom. Just as he looked in, the chain slipped from Jerry's nervous grasp and rattled free to the floor.

There was a look of blank, frightened amazement on Chub's face. Jerry saw the surprise, but it was the real fear that showed which awakened in him the fire that the free soul lives upon.

With a spring that was as quick as a cat's and as certain as a cannon-shot, he leaped and drove his fist straight into the swinging jaw of the little river rat.

Chub's light went out like the passing of a thunderbolt. He went clear across the cabin and against the side of the boat with a thump, and then slid limply to the floor, knocked clear out by that one swift blow.

Jerry was free now. He felt his freedom growing, too, and he worked swiftly. He went through Chub's pockets and took away his pistol and knife.

He found a key to the handcuffs, and unlocked the one from his own wrist, and put it on Chub's. Then he locked the other cuff on to the anchor-chain. He put the cut link fragments into his own pocket as a memento.

Then he saved the sausage from burning and the coffee-percolator from cooking too long. He wasted no time on anything till he had prepared for the return of Delp, who might arrive at any moment, but who might not return for a day or two.

"I've partly reversed conditions," Jerry said to himself. "But I want to hold out a little while before I let go all holds down here on the Mississippi. I'm going to know more about that railroad and the rest of those things."

While he thought, he prepared for siege and war. He gathered all the firearms and put them into shape so that Chub, when he came to, would not have access to them, but where Jerry himself would have them right in hand, with plenty of ammunition.

Having settled this phase, he turned to Chub and brought the little rat to with smelling-salts, some cold water and first-aid work. Chub recovered, but slowly.

He came out of his daze with a look of abject terror on his countenance. Then he began to cry as little by little he gained intelligence. At last, when he could see and hear and think, he began to beg:

"Don't kill me, Mr. Fander! Let me go, Mr. Fander! Hit weren't me, hit were Delp that put up the job on you, an' I had to do hit! He'd killed me if I hadn't, suh! Don't kill me, suh!"

"I won't hurt you unless you act mean," Jerry said harshly, but with a novel exultation in his heart.

Never in all his born days had Jerry felt just as he did now. He had risen by his own efforts and wit superior to a genuine, man-grown situation.

His boy triumphs in athletics had been play, and he had felt all the time that they were play, and with no serious intent. Now he had been overcome, but had recovered his status as a free and independent citizen. Never again would he be quite the same in his own mind as he had been before he broke loose and put the shackle on his captor.

He looked forward to the return of Dan Delp with increasing confidence. He would face Delp with a gun and he would try to capture him. Perhaps Delp would get the drop and shoot—that was a grim and certain chance of the game of being one's own boss!

Jerry was ready to take the chance. When he had taken it then he would go on and see what there was to do next. He just had to get the best of Delp, for the reason that Delp had the key to Jerry's game, played against the executors of the Fander estate—a game which had been increasing more and more in importance, till Jerry had brought forth five hundred dollars, which the river rats had not found, and convinced them that the way to get the best of the executors and obtain the one hundred thousand dollars reward was to send for a reporter to write up the true account of Jerry Fander's predicament.

The capture of Chub and the overcoming of Delp thus became but a move in the Jerry Fander game—a game that would have made the young man's father proud of him, and satisfied with him.

The two men ate breakfast together, Chub recovering rapidly under the stimulus of a stiff drink of brandy which Jerry mixed for him. Chub was grateful for the favor.

He now became meek and pitifully anxious to please. He was the prisoner, he was the one to obey now. The whine in his tone, never wholly eradicated, was now exasperating to Jerry, but he forebore taking advantage of it.

Revenge was no part of his plan. It was now a matter of business. He found himself reaching out in his mind and marshaling the facts and ideas, planning his moves with new and increasing certainty.

"Why, Chub, you scoundrel!" he exclaimed joyfully. "You've made a man of me! I've

been just a kid all my life, but you've given me a new view of life! Soon's I get Delp where I want him, I'll show you how grateful I am, you bet I will!"

"Oh, Mr. Fander! Don't kill me, Mr. Fander! I neveh—" Chub choked.

"Chub, you darned fool!" Jerry exclaimed. "I mean it! I'm grateful to you! Can't you understand that? You've made a man of me!"

"Yassuh! Don't whup me, Mr. Fander! Lawse! I neveh wanted to kill yo', suh! Hit were Delp!"

"Come off! Be a man, Chub! Don't be afraid!"

"I—I cayn't he'p hit, suh! Luck's neveh broke right with me, suh! I—I always be'n hit an' down an' tromped on!"

"You poor fellow, you!" Fander shook his head.

It seemed now to Chub as though Luck had struck its worst and hardest blow just when everything seemed working out to Chub's advantage, and according to the pitiful little dreams of satisfaction for the wants which all his life had afflicted the undersized, incompetent, helpless little victim of—of Bad Luck!

Jerry cleared up the dishes and made up the bunks and bedding. As he worked he heard sobbing; and, looking out, he saw Chub lying face down on the cushion of a locker, crying and moaning as if his heart would break.

The misled but unpampered young man stared at the spectacle with emotions that conflicted. He thought he had never seen the like of that before. But after a time, as he grew more and more uncomfortable, his memory returned to a day away back in his boyhood when he had been playing hard and steadily from morning till night.

Just at the end of the day he had wished he might have a box of candy. This had been refused; and, tired as he was, he had begun to cry. He had fallen down on a couch, and there he had wept and sobbed because he wanted the candy so very much. After a while his mother had brought him some candy.

"But it wasn't candy that poor fellow wanted!" Jerry said to himself. "He just wanted a little shanty-boat to live on the river and have all he wanted to eat, all he needed to wear, and cartridges for his guns.

"He would be satisfied with that—just enough to eat, without having to steal it, or do work so hard that it would break the muscles of his back to do it! Poor little runt of a man'"

All that day Jerry watched and waited for the return of Dan Delp, and when night came he prepared for the return after dark. He sat with his repeating twenty-gage shotgun on his lap, just outside the door of the dark cabin. Here he could see the direction of the pathway which already began to show through the woods toward the other water arm where the pirates had kept their boat, in order to hide the Fairy Land the more securely.

After midnight he saw a sparkle of light out in the woods. Delp was coming. The second critical moment of his adventure was at hand.

CHAPTER XVIII.

THE REPORTER'S INTERVIEW.

DAN DELP led the way with a lantern from the semi-cruiser's landing across the brake to the bayou in which the Fairy Land was boomed in by a raft of drift. The Fairy Land sat like a dark shadow in the water, but a flash or two of light reflected from the windows indicated what it was.

Walts, the reporter, carrying his portable typewriter, half-blinded by the flashing of the lantern and stumbling over the roots and fallen limbs in the course across the land neck, revolved in his mind the words of description which would tell readers about that lair of river pirates who had trapped the scion of one of Pittsburgh's most eminent families.

It was just the kind of a place for hiding a man held for ransom. It was miles and miles back from anywhere. Coming to it in the night helped give the wilderness its due gloom and appearance of impenetrable fastness, but the pirate knew the secret of the forest and could follow in the black intensity a trail so hidden that a most expert tracker could hardly recognize it.

The possibilities in his own case were not thought of by the reporter, who was too good a newspaper man not to chance anything in order to come to a great story. He knew that he was at the supreme chapter of a news novel—one of those splendid, rounded-out, complete stories which are the delight of the men behind the daily printed page.

Most stories break out in fragments, like icebergs falling from a glacier—this story of Fander had been that kind, a sort of continued-in-our-next story, with a lot of exasperating and irrelevant matter filling up the pages. But now this coming chapter was to be most satisfyingly complete.

He stumbled along, not with unpractised woods steps, however, for he was used to

camping out and wandering through timberland—never before, however, in such a timberland as this, where the ground was soggy and his foot sank into the matted leaves, pressing water up around the edges, when he was not walking on a log or stepping from root to root.

His pilot through the swamp led him to a gang-plank that went up on the sides of the stern-wheel, slate-colored boat which he knew was the one Fander had tripped down the Mississippi. Delp landed on the bow deck lightly, and turned toward the cabin.

As he did so, he dropped his lantern, raised both hands and gasped.

"Hands up!" a firm voice demanded, as the bow deck was flooded with light from an incandescent under the eaves of the pilot-house.

Walts stooped and rested his typewriter on the deck and raised his own hands.

"Get inside there, you!" the voice of the unseen ordered.

Delp entered, and Walts, picking up his typewriter carefully, followed the pirate. The cabin was brightly lighted now, and there in the bow, on a locker, Walts saw a disconsolate little man, like Delp, but shaggy and gray and colorless. When he turned he found behind him a firm-featured, tall, slim young man, an almost conventional cutey type.

"Jerry Fander!" he exclaimed.

"Yes. You're?"

"Fred Walts, of the Pittsburg *Copewell*."

"All right—just a minute!"

Fander disarmed Delp, made him take his seat beside the other river man and snap on his wrist the other loop of the pair of handcuffs, so that Delp and Mildy were now prisoners strung on the same piece of anchor-chain.

"They had me fast," Jerry explained briefly; "but I cut loose with a nail-file, and when it came in two I caught Mildy, here, napping. Now I've caught Delp, too!"

Jerry grinned good-humoredly. Delp turned and said three emphatic words to his cringing partner.

"You'd have tumbled, just as he did, Delp!" Jerry rebuked him, and then turning to the reporter, continued:

"I'm glad you've come. This doesn't alter the situation, to speak of—"

"Well, no—"

"The story isn't spoiled—"

"Hardly!"

"All right. You've no objections to helping me out?"

"Not a bit!"

"All right. I'll have a cup of coffee and something to eat. Then we'll have a little sleep, and to-morrow I'll tell you what I've been up against, and what I'm up against. I think you can help me more than any man in the world. You see, you've given me a square deal in the *Copewell*. Did you write those stories?"

"Yes, I handled your case."

"How did you happen to write me up as less than a horse-thief, and probably no more than a misdemeanant?"

"Why, I—I— We're careful about libel, you know."

"The other papers weren't!"

"No, of course not—you see—um-m."

"The executors gave the story out?"

"Why, yes—Shadder, that is."

"The detective-agency manager! I'll fix him!"

While he talked Jerry prepared the midnight supper. It seemed to Walts as though he had never smelled anything more fragrant, even if he had eaten a tremendous meal before starting out with Delp on the midnight cruise.

Every word, every act, every thing he saw there was adding to the story which he had come seeking, and now found in its full bloom.

"You don't mind if I write my notes as I go along?" Walts asked.

"No—not at all! I want you to write it just as you're getting it. I want the story to be told just as it is! I'm not the scoundrel they've painted me to be. I'm sick of being the kid. I want what I say to go, for once in my life! Those blanked tight-fists in Pittsburgh—"

Jerry broke off, choking with the anger that came to him as he realized more and more clearly that the executors of his father's estate had refused to turn over a paltry hundred thousand, even to save the life of the heir.

Indeed, instead of supplying the funds, they had taken the very course that would eventually probably have resulted in the killing of the victim. Happily, however, he had surmised the situation.

He turned and looked at the two river pirates. It would be a long time before he forgot the cold, impersonal determination in their eyes as they warned him that he must obtain their money or he must suffer the consequences. He knew how the prisoner condemned in court must feel!

Walts, finding the story breaking larger than he had hoped or dreamed possible began to thresh his typewriter, making his notes. At that rapid clatter, the river rats straightened

up and watched his slim fingers tripping over the keys. Fander himself, long familiar with the big world, was also interested in the display of digital agility.

So he wrote till supper was ready, and then Fander set up chairs for all four of them.

"Give me your word you won't make a break during supper?" he asked Delp. "If you will, I'll take off the bracelets!"

"Sho! Yo' mean hit?" Delp gasped, and Mildy looked his bewilderment.

"Sure as you're born!"

"Yassuh; we won't, suh! I'll bust his fool haid if he moves!" Delp assured Jerry.

"All right then."

He unlocked the handcuffs and threw the chain on the locker.

"Now sit up to supper, boys!"

Fried rabbits, hot biscuit, sorghum molasses—it was just a plain river meal, but the coffee was excellent, with plenty of canned cream, white sugar and some waxed-paper cookies and pound-cake. They ate long, slowly and with much gusto.

"How did you find him, Dan?" Jerry asked.

"I hearn down in the bend that a feller was drappin' down out 'n Helena with a typewriter. 'Course I knowed who hit was. Mrs. Rudsa was tellin' me the Kate's pilot told her. I come up into Arkansas Old Mouth, an jes' hung around. This feller come in, an' 'course I knowed him. I had to wait around, though, while he fed up with some of them shanty-boaters, an' then Tressy Wooten ketched 'im—"

"Eh? Who'd you say?" Jerry exclaimed.

"Tressy Wooten," Delp grinned, laughing at Walts's embarrassment, "an' I kind of hung around, listenin', an' one thing an' anotheh, twell they got through sparkin' out into the brake, on to a big log. Shucks! He didn't kiss her, an' I bet nobody eveh did git to kiss her yet! Her maw's kept her tied that clost, they's no tellin when that gal will break loose.

"Lawse! When she does—hue-e-e! If she's anything like her maw, I bet—I don't know what I wouldn't bet! Yo' take them ladies that knows an' has be'n thar! Yo' bet they keep their apron-strings cut short an' tied up with no granny knots!"

"I met Tressy coming down," Jerry said. "She was away down below Rosedale, drifting, and no gasoline. I towed her up—motor didn't run right, somehow."

"Yo' say yo' did!"

"Yes. I tried to give her the gasoline, but she wouldn't take it. She would have been angry if I hadn't let her pay."

"They's that kind, them Wootens—independent!" Delp remarked. "They's bright women, them Wootens. They ain't no women on Old Mississip' does any better'n they do. They's rich. They catch furs, shoot feathers an' frog turtles.

"They don't waste no time. They keep workin'. I neveh seen 'em tied in nowhere, 'ceptin' into lonely bends er in chutes behind brake islands. They lie where the fur's thick, er birds plenty er turtles is lots.

"But they be'n to Arkansas Old Mouth, tied in right amongst shanty-boats. They neveh done that afore. I don't know what ails 'em."

"Mebby the old woman 'lowed she'd betteh loosen up her apron-strings a bit?" Mildy suggested innocently.

Walts blushed and Fander didn't know whether to blush or not. The river pirates laughed aloud. It was a gay supper.

The captive pirates did their share of entertaining. They told stories, and under Walts's leading questions, they told how they heard that Fander was coming down the Ohio, and how they moored under the bar at the junction of the Ohio and Mississippi, waiting for the Fairy Land to come down.

They described their hunt of the Fairy Land down the river for more than four hundred miles, watching the Fairy Land make reach, bend and crossing, waiting for their chance to board and capture it. They had almost had a chance in Walnut Bend, and again just below Helena, but not till they came to White River, in the lonesome Victoria Bend, had they ventured to strike.

"Then we come aboard, lookin' fo' a spark-plug," Delp said. "Mildy got one side an' I got the other. I black-jacked 'im on the back the neck, wheh yo' always hits a feller if yo' don't want to kill 'im. He slumped down, an' we come right down yeah—an' hyar we be. On'y he— How'd he git yo', Mildy?"

"I—I don't know, Dan! Hope to die I don't!"

"What!"

"That's right," Fander interrupted. "I cut the anchor-chain—the handcuffs were tempered too hard. The chain broke before I was quite ready, but I waited till he stuck his head into the bunkroom door, and I landed on his chin—hard!"

"Yassuh, yo' shore did!" Mildy agreed.

"I bet seo!" Dan nodded, adding: "I 'lowed yo' was ketched nappin', but yo' couldn't he'p hit. Yo' must of worked on that chain quite a time, suh?"

"Yes, a good while."

"Yo' know, I seen iron-filin's on the carpet theh, but I jes' didn't happen to think. I 'lowed hit was fixin' the motor er sunthin'."

Delp shook his head.

"I were plumb keerless; yassuh, same's Mildy!"

They smoked a cigar around, and then the two pirates, without a look or suggestion, picked up the handcuffs, slipped the wristlets on their hands, and snapped them shut, tight up.

"If you boys 'll give your word not to try and break away—" Fander began, impressed more than he had ever been before.

"No, suh."

Delp shook his head.

"Yo betteh keep yo' eye onto us. We could say we'd not try to get away er anything, but we's liars, both of us. Yo' can't place no dependence onto us, suh. Yo' treated us white, an' we ain't goin' to lie to yo, suh. We's desp'rit. Luck neveh did break ouh way, same's I said. We—"

He blinked unhappily. The two Pittsburghers, greatly moved, did not know what to make of what they had heard. Walts had heard crooks and detectives joshing one another in police headquarters, telling with fond sincerity how they would break one another's heads at the first opportunity. Here the river rats were telling the truth when lying might have enabled them to make a better getaway.

He wondered what Fander was thinking, but Fander did not make any comment. He made down a bed on the cabin floor for the two prisoners, and put the reporter into one of the bunkrooms.

All the following day the reporter worked, making notes for his story. Jerry told him quite frankly but confidentially the game that he had been playing in order to save his life from the pirates, by getting the ransom through stratagem.

"This changes the plan a little," Jerry explained. "But I think that it 'll be all right for you to write just what happened, how I was caught, held by unrelenting, merciless river rats, and how I escaped from them. I want the story printed just that way—with me here in these swamps, holding the two pirates captive. I've an object in doing that I've a note to write to my dear executor-guardians!"

"But why don't you come right out and deliver them to the authorities?" Walts asked.

"I—you see—well, I gave them my word, those rascals! I can't break it. Besides—um-m."

"Your word?"

"Yes, I didn't tell you about that. You see, in a way I'm one of them. We agreed that what they needed was sixty thousand dollars. That would make them perfectly happy—the income would, you know. I wanted forty thousand dollars. We had a kind of a bargain that way—understand?"

"But—a bargain with those crooks!"

"Yes. Father never in all his life went back on a bargain, bad or good. The gang he traveled with—but no matter about that. Don't say what I said about his associates! You'll come back as soon as you've written your story? You see, you know—I want some information from you. I've given you my story."

"Why, of course. I'm perfectly willing. I'll come back. But—"

"I want to ask you one question: what did you mean about the Swamp, Delta and Bayou Railroad—the Fander estate's relations to it?"

"I see," Walts nodded. "Of course, I'll come back. In fact, before I go I want to say that I have quite an admiration for Mississippi River pirates, compared to some crooks."

"That's what I've been thinking!" Fander declared.

Then they parted, Jerry returning into the boat.

CHAPTER XIX.

TRESSY, THE WOODSWOMAN.

"WHERE yo' be'n, Tressy Wooten?" Mrs. Wooten demanded as soon as Tressy was on board their boat, and the doors were closed against intruding ears.

"Oh, I jes' been sparkin' around a little," Tressy answered lightly.

"What!" choked Mrs. Wooten. "Who yo' sparkin' with? What yo' mean?"

"Oh, I jes' 'lowed I'd spark aroun' a little—"

"Well, yo' won't! My li'l' gal runnin' aroun' with them he-scoundrels! Why, I'll shoot their haids off, an'—"

She turned to the nail on which she had long kept a long, limber mule-skinner to dress her daughter down when Tressy became obstreperous.

"Where's that whip?"

"I drapped hit overbo'd, mother!" Tressy announced calmly.

"Yo'—yo' drapped hit overbo'd? What!

Yo' gone crazy, gal? Sparkin' an' drapped my whip overbo'd!"

"Yes, motheh!"

"What ails yo', child? Yo' gone crazy?"

"No. Hyar I be, eighteen years old, an' I neveh was sparkin' yet, an' I 'lowed if I didn't want to be an old maid, I'd shore betteh git to talkin' with some young fellers—"

"Yo' set there an' tell me yo's be'n talkin' to men—*men!*"

"They wa'n't so overly growed up, mother! Kind of young fellers—"

Mrs. Wooten uttered disconnected sounds. She was so angry that she was speechless, even if she had had anything to say.

"Afteh all the cyar I took—to keep yo' pure an' sweet—yo'—yo' go off 'n' talk to young fellers—say shamelessly yo' be'n sparkin'!"

"Well, if settin' on to a log talkin' to a feller sp'iles a gal, they's shore delicate!" Tressy remarked judiciously.

"But—but what 'll folks say?"

"What they be'n sayin'? 'Tressy Wooten ain't like her maw, so overly much!' That's what they be'n sayin'!" Tressy exclaimed with some feeling. "They—they 'lowed I neveh—neveh 'd be like yo', an—an'—"

"Good Lord—like me! I should hope—I should—"

Mrs. Wooten looked from side to side, frightened beyond measure by the suggestion. She burst out:

"I don't want yo' like me! Tha's the reason! I wanted yo' nice an' refined an' delicate, so's yo' be good 'nough fo' any man—"

"Shucks! They ain't a man on the riveh good 'nough fo' yo', an' hit neveh did hurt a lady if she wa'n't so delicate but what she could bust a feller on the haid if he got to tookin' liberties, an' kissin'—"

"That feller didn't kiss yo'?" Mrs. Wooten demanded hopefully.

"Well, I bet not! They ain't no man goin' to buss me tell we's shore hitched up, an' goin' to git married, the way they has hit in them story magazines. Yo' bet not!"

"Why—I—I was jes' skeered, Tressy. Men is such awful critters—my land! Don't I know?"

"Well, I ain't found 'em so dreadful," Tressy remarked judicially.

"Yo' ain't! That's jes' the trouble!" Mrs. Wooten exclaimed, worried. "They don't seem dreadful first along—"

"When they git dreadful I expect I'll jes' bat 'em on the haid, er somewheres, an' light out!" Tressy said.

"Long's you do that, yo's all right," Mrs. Wooten remarked relieved.

"Say, mother!" Tressy began, changing the subject. "Yo' know that feller that's rewarded? Well, Dan Delp took him an' his'ns boat, the Fairy Land, an' now Dan Delp's right yeah in Arkansas Old Mouth!"

"Theh's a thousand dollars' reward on him!"

"That's jes' what I was thinkin', an' I'd shore like to git that reward. We could watch out—"

"If they ain't got him sunk into the riveh, they's got him lost into a dark corner. Hit 'd be jes' luck, catchin' him."

"I got an idee, mother! They's back into Ozark Old River Lake. If we'd jes' drap in theh, we'd git a whack at 'em—"

"Hit's good turtlin' and trappin' in theh, too, I've heard say."

"Nobody goes trappin' in theh—so lonesome!"

"Well, we can stand the lonesome if we gits furs an' turtles!"

"An' if we git that feller that's rewarded!"

"Hit's seo!"

Tressy went up the river-bank in the morning to see what had become of the young man with whom she had sat on a log the previous evening. The little motor-boat was there, but not the man who wrote for newspapers. Kep Doyne explained:

"Him an' Dan Delp went off into Delp's bo't last night, to'd midnight. They left me to took cyar of the bo't!"

"Yo' say they did!" Tressy scowled. "What 'd Delp want of that feller?"

"'Lowed to show 'im some wild turkeys er a dark corner, I reckon," Doyne grinned. "He took his'ns typewriter, too."

Tressy made no comment, but went on strolling. She wondered what the incident meant. She surmised that it had something to do with the lost heir for whom the money was offered.

"The best thing we can do is git oveh in theh!" Tressy said to herself. "There's no telling what devilment Dan Delp's up to now!"

They towed their boat up the Arkansas and through Duckhunter Bayou into the Old River Lake. They coasted along the near shore, easterly for a mile or more, and arrived at a little bay, which had been an eddy when the Mississippi flowed through that bend, before the cut-off which made of Ozark Old Bend the still, green waters now called Ozark Old River Lake.

On all sides the woods came to the water's

edge. Ducks rested upon the little waves or came flying down into the water from up high.

In the trees were many squirrels, and there could be no doubt that there were many coons, many 'possums, many wild-cats and other fur-bearers there.

They could hear in the woods the noise that a flock of wild turkeys makes. There were the scratchings and rustlings as the birds worked through the dead leaves after mast; the hens were uttering in a low tone, "*put-put-put*," the young birds were noiser and livelier; at intervals sounded the brief, proud short gobble of a big strutter.

The sharp, practised eyes of the two women discovered innumerable signs of turtles. Few knew how very profitable the business of catching turtles—fresh-water terrapin—could be, if pursued intelligently and with vigor.

The two women for many years had "turtled" with increasing success. They knew when to trap, when to turtle and when to fish or hunt. As Mrs. Wooten would explain:

"Take some an' they jes' fishes. Yo' cayn't fish all the time an' get fish. Some jes' traps, an' lazies aroun' all summer. Some jes' hunts feathers. A person wants to have six-seven things to do, down Old Mississip' an' then he'll git work enough to keep him busy."

Having tied in where the south and west wind could not strike them to throw waves into them, Tressy went back into the brake to look around. She knew that few cared to brave those dark woods.

It was worse than Big Island in there, for the high land ran down into cypress brakes, and the tupelo gum's deadly foundation in soupy mud was on all the lowlands, treacherous and ready to draw in any victim that it could catch in its depths of ooze.

Tressy, with her eyes noting the trees so as to make sure that she did not lose her trail, strolled along, light rifle in hand. It was big game country—bear, deer and panthers lurked there. It was also the last haven of the scouter, the human game sought by men-hunters who did not object to blood-money of the "Dead or Alive" posters.

Tressy, seeker of a reward herself, and knowing well the Mississippi bottoms, knew very well the character of that gloomy wilderness. Neither she nor her mother had ever been in that locality before, but they were not afraid.

Women who live on shanty-boats down the Big River could not know what fear is, and remain on the river alone.

Tressy studied the ground, watching for game-tracks and the tree-trunks, watching for the clawings of fur-climbers. She listened and heard the whisperings of the deep swamp, the far *put-put* of wild turkeys, the swish of branches left by leaping squirrels, the low utterances of little birds, venturesome but alert and doubtful

"Hit's jes' the place fo' them scoundrels to hold that feller!" Tressy thought to herself. "I'll go lookin' around; these yeah waterways is full of hidin'-places, but like's not I can find sunthin'!"

She placed three or four traps along a deep, narrow bayou that appeared across her course, and turned back to the lake again. As she approached the lake she could see the pale, beautiful green water rocking lightly in the sunshine of late afternoon.

Then she heard a low sniff; and, turning, discovered a deer standing not thirty yards distant, erect, proudly as a cast statue on a lawn, ears and spike horns up, eyes staring.

Tressy dropped her right foot back, turned half on her left heel, and with the same motion threw up her rifle, aimed and fired—a beautiful shot! The deer gave a surprised hump, turned clumsily and bumped away with short, bucking jumps.

Before the animal was out of sight it stopped galloping, to trot heavily. From the trot it changed to a crooked walk, and at the end of that, the buck lay down, looked around with a puzzled, blinking stare, and then slumped over. After a few kicks, it was dead, shot through the heart.

The huntress had killed a fine animal and she was greatly elated. She ran and called her mother, who came and helped drag it in. The two, long experienced in river affairs, rapidly reduced the creature from a sleek deer to venison in chunks, which they carefully put away, some for smoking, some for immediate use, and some for the salt-box.

Where the deer was killed, Tressy put out four most cunningly placed traps, not close up to the bait, but at some distance, in a runway which passed that way; one she put on a low mound, under moss and matted leaves; the third she put in the runway opposite the other runway trap. Then she sprinkled water in her own footprints, and retreated some distance from the scene of the kill. In all these things, and in the finer points of concealing the traps, an expert trapper would have recognized her rare ability and knowledge of certain swamp wild things.

In the morning when she went out to look

at the set there was a wolf in one of the runway traps, and another one in the trap that had been placed on the low mound.

A coon, no doubt attracted by the furor made by the wolves, had walked into the other runway trap on its way to the scene. The fourth trap, placed at random at the butt-end of a fallen tree, had nothing in it, since no animal happened to have walked around the end of the tree, instead of going over it.

This was what was to be expected in those old swamps if one trapped in them. But there was more than just fur-bearers, more than game and meat animals.

Away back in the depths, at far intervals, were little cabins and even huge hollow cottonwoods in which the most dreadful of all brutes live—fugitive creatures that walked and talked like men.

It was on their account that few trappers, few hunters, even the bravest of men hunters, cared to enter into the Ozark Old Bend Brakes. Right there, in the midst of the brakes and waters, two women set about their hunting, trapping and turtling with the *sang froid* of river people, and yet, for all the elder woman's experience she did not know just how bad, how desperate matters were there in those low bottoms.

Tressy, on the day following the shot at the deer, took her little motor-boat and started out to circumnavigate the Old River Lake. She followed the shore line west and south along the curve.

She went clear down, back of Ozark Island proper, then returned close to the easterly shore, and turned up in the long, wide arm of what was formerly Ozark Island Chute. In the finger-arms of the chute she ran on half-speed, dodging the sunken logs and looking for the Fairy Land in the dark windings.

She ran into bayous so narrow that she could not turn around in them, but had to back out again. She went two miles up into one of these, and returned in safety.

Having explored the Old Chute, she turned back into the Old River Lake, skirted along the new bar and so worked up into the long bayou arms, or fingers, at the head of the lake.

Back in those recesses, rounding a deep, narrow turn, she came to a landing with Dan Delp's semi-cruiser moored to it. The landing was just a huge gum-tree, which had fallen down into the bayou, and one of the broken limbs made a convenient mooring-stake for the stern-line and a root held the bow-line.

It was so near and the discovery was so unexpected that Tressy was startled. She shut off her motor and seized her rifle, watching the cabin for signs of any one on board. Steering alongside, she look into it, and saw only a leather bag, which she recognized as the outside of the typewriter that the Pittsburgh reporter had carried.

As she stood there, with a turn of a line around a cleat on the pirate craft, wondering what to do, she heard footsteps, and a moment later, as she poised her rifle, ready for swift work, the reporter came into view.

"Why, hello!" he greeted, and she smiled her welcome, lips and eyes.

"Well now, shucks!" she exclaimed. "Yo'-all shore will git lost in this yeah brake!"

"No!" he shook his head. "Never! I'm a woodsman, and I've a compass. Say, you know, Tressy, I've the greatest story a reporter ever did find! Been working ever since yesterday and it's ten columns long, more or less! It's a dandy! You know, Fander's kidnaped the kidnapers!"

CHAPTER XX.

GONE!

"KIDNAPED the kidnapers?" repeated Tressy doubtfully.

"That's right; he cut loose from his handcuffs and knocked Mildy in the jaw—knocked him out. Then, when Delp and I came on board he held us both up. But he put Delp in chains. You see, I came to interview him."

"An' he's theh on that bo't with them two fellers? Why don't he run out an' give 'em to the sheriff, er sink 'em in the riveh, or like that?" Tressy asked, puzzled as Walts had been.

"Why—it's just a notion—scheme of his," he answered lamely.

"Well, all I got to say is he's a darned fool, stayin' in these brakes with two such scoundrels, even if they is chained up. Be they chained up? Yo' said so."

"Yes—both in one pair of handcuffs."

"Hit mout be all right." She shook her head. "I know about that Delp. One time he took the grate out of a red-hot stove, dipped hit into a water-pail an' then unscrewed all the bolts on to a jail do'r an' got away. Anotheh time he picked a jailer's pocket an' helt him up with his own gun, an' got away.

"Then wunst he had a gun into his rubber boot; the sheriff didn't notice, an' on the way to jail he helt up an' robbed the sheriff of

seven hundred dollars an' his'ns guns, an' so on. An' one time he sawed his'ns way out'n a jail with a paper of sewing-needles.

"My lan'! I'd shore hate to be watchin' two such scoundrels; why, them fellers 'd eat their way out'n jail with their teeth! Ain't that Fander no sense?"

"Why, perhaps, I—we'd better go back and warn him."

"No, some darned fools has to learn by 'sperience. When he's be'n on Old Mississip' a while he'll get sense into him. Yo' expaict yo' can steer yo' own way out'n this brake?"

"Why—I—I hadn't thought of that!"

"I betteh show yo' which way is out an' which way ain't. Yo' keep yo' eyes open an' when yo' come back yo' can find the way. Me 'n' maw's tied in on yon side Old Riveh Lake. I'll show yo' where. When yo' come back—yo's comin' back?"

"Certainly!"

"Well, yo' drap in theh, an' mebby I'll have them fools tied in theh, too. The whole caboodle of 'em needs lookin' afteh!"

Walts, following Tressy's launch in the pirate's semi-cruiser, threaded the way out into the open lake. He watched back to make sure that he would know the return route.

As soon as she had piloted him into the open she turned back, and they stopped their boats so that Tressy could talk to him a little. She had found a new pleasure in life—talking to young men!

"Which way yo' goin'?" she asked. "Arkansas City or Rosedale?"

"I hadn't thought. Which would be best?" he asked.

"Rosedale's nearest."

"Is there a telegraph office there?"

"Yassuh; an' a railroad."

"I'm glad to know that. Probably I won't use the telegraph, though; it's such a long story that I think I'll have to send it by mail."

"Yassuh," she answered doubtfully.

"Yo' betteh be a gittin'!" she remarked suddenly. "Hit's comin' night, an' hit ain't easy travelin' in the dark. 'Sides theh's a storm comin'. Out'n the west."

"Perhaps I had better be going," he acknowledged. "I'm very, very much obliged to you!"

"Hones'?"

"Cer-tain-ly!"

"I'm obliged, too!" she laughed. "Mos' young fellers 'd be skeered to talk to me, with my maw what she is!"

"A man would brave almost any danger for some pleasures," he suggested with a smile.

"Sho! Yo' say they would? Yo' 'low if a man knowed he was goin' to git shot up, er beat up, er ketched up, he'd talk to a gal?"

"No doubt about it!"

"I read that into papehs and magazines, suh, but I'm dadgasted if I'd believe hit, suh. But yo' know what maw is, an' yo' talk to me, right yeah, where she may be lookin'!"

Walts smiled. He did not even look along the shore of the lake where Mrs. Wooten might be.

The wide, blue-eyed look of Tressy held his own gaze against all threats, even against the threat that now appeared in the lifting gusts of wind which began to carry along the lake out of the west.

Tressy searched his gaze frankly, studying it as she might have studied the eddy point where she aimed to cast a hoop-net. Apparently her observations satisfied her.

"Yassuh!" she laughed, looking away. "Yassuh! Hit's seo! Maw is always sniffin' an' 'lowin' men ain't good's anybody, even when they behaves themselves, but they is! Yo' ain't a skeered of maw er the wind that's a risin'!

"But yo' betteh hit a lick, suh. Git thar! Right yonway's Duckhunter Bayou, leadin' to Old Arkansas. The wind 'll hold yo' theh to-night, I bet! Yo' cayn't make Rosedale on Big Mississip' with that gale a comin'. Good day, suh!"

They started their motors simultaneously. As they did so, a sudden gloom seemed to fall upon the lake, and the green waters turned suddenly slate and opaque. Out of the west the surface began to show white.

"Git thar!" Tressy called with a laugh. "Yo' betteh git into the lee, an crawl along!"

She pulled away back into the gloomy bayou, while he headed diagonally across the lake. Within a hundred yards a hammering blast came against the cabin and along the side of the launch.

Walts had slipped into his oilskin coat and overalls. The wind carried a cold, sleety spray from the crests of the low waves. These rapidly grew in height, but the high bow of his little launch rose to them, and the long, low cabin split the waves and the breaking crests.

He plowed through, the rollers rising higher and higher, till he was teetering over them, rolling like a torpedo-boat, and plunging deep on the far side—and through the storm came wild fowl, ducks, geese, and cormorants, seeking shelter. They whirled by, some quacking, some honking harshly.

The dark, slaty clouds seemed to be among

the tops of the trees, and as he looked, he saw the rain coming, a gray, streaked curtain that reached from the clouds to the surface.

Never had he seen or experienced such a downpour as that! In a minute he realized that it would soon fill his boat, swamping it. Instantly he started the centrifugal pump turning, and out of the pipe shot a long stream of water—already the pump had a suck!

Suddenly the wind coughed and was lost. He did not understand what had happened, for he still heard the roar of the wind and the sweep of the waves. He discovered a dark mass in the gray rain, and knew that it was the lake-shore, and that he had run into the lee of the trees.

Running along the steep-banked shore, he soon came to the black opening of Duck-hunter Bayou. He slipped into it, and a few hundred feet along the stillwaters he shut off power; in a minute the boat slowed down and drifted into its own harbor, in the "V" of a fallen tree lying down the bank and in the water.

Walts made fast with bow-and-stern lines, then crawled into the low cabin, turned on the battery lights, closed the door and let it rain, his bail-pump running at half-speed, to empty out the water that the rain poured into the open cockpit.

"Now I can write my story!" he exulted to himself. "I've got all the time I need, and I'll write it to the finish; then for the post-office!"

Reporters often write their stories in strange places—under as remarkable circumstances as many of the tales they have to tell. Fred Walts had every inspiration to help him in the chapter he now had to put down—the chapter on the captivity of Jerry Fander.

Having been to the scene of that gloomy swamp-land brake, having behind him the great river and its rushing torrent, knowing now the river pirates, the shanty-boaters, Tressy Wooten and Ozark Old River Lake, with full details of the incidents of Jerry's capture, jeopardy, escape, and with the hint of a plot to keep out of the story for some future chapter perhaps, he sat with the typewriter on his lap and pounded away, page after page, hour after hour

The storm gloom faded into night-gloom, rent by winds and gusts and sheets of lightning at rare intervals. He forgot his supper, forgot that there were such things as midnight, time, thirst, hunger.

Suddenly, the bright yellow electric-light faded and grew dull. For a minute the letters on his paper seemed to fade. He strained his eyes in the last rush of the final page of the narrative he had in hand to do.

At last he slumped back in his cushioned seat, his hands dropping on his lap, too tired almost to take the final page out of the machine, cricks in the back of his neck and his lungs feeling so empty as to fill his heart with vague alarm. He blinked, his eyes aching, and looked around in wonderment.

"Why!" he said. "It's daylight—I—Lord! What a story! Now I must get it to the post-office! There never was a story like this before!"

Just so is the great news of the day gathered and written. Walts snatched a bite of bread and butter and a piece of dried beef, backed his boat out of its little harbor, started half-speed ahead, and steered through the bayou into Arkansas Old Mouth, down past the shanty-boat town into the Mississippi, whose far side he could not see for the falling of thick, misty rain.

He steered up-stream, keeping near the west bank for a while, and then cutting diagonally across to the east side, following up the caving west side, and then past almost up to the sand-bar and into Rosedale Landing Eddy, just below the Klondike, the whisky-boat.

There Walts moored to a stake, called a white youth from the shack up the bank and gave him a quarter to watch the motor-boat while he ran—ran through the mud and wet weeds to the top of the levee, and up-town.

He turned down from the levee where a sidewalk appeared beside the road along the foot of the levee. He clattered along the sidewalk and, as he ran, heard the whistle of a locomotive. At that sound he broke into full-speed, regardless of his wasting breath.

At the post-office a man said the mail had just gone up to the train.

"Theh'll be anotheh one to-morrow," the man urged, as if all that haste were needless when a mail would come so soon. Of course Walts could not feel then the jubilance of a town that had formerly got along with a twice-a-week stage and once-a-week steamer-service.

Walts arrived at the railroad station and ran ahead to the baggage-car. The baggage-man, who handled the mail-bags, took the thick letter and Jerry Fander's note to the Fander estate executors.

"Must be yo' sendin' a deed to all these yeah bottoms!" the man grinned.

"No—just a story for a newspaper," Walts smiled, while he choked for breath.

"So! Well, now, is that so? I bet they

ain't a word of truth into hit, 'cause they don't no newspapers eveh git the truth, do they?"

"You go to blazes!" Walts grinned.

"I was jes' a foolin'!" the railroad man grinned. "I—"

"Hey, Jim, yo' goin' to talk all day theh? Hit's time to be pullin' out!"

The conductor was looking at his watch with impatience.

"Jes' a minute, Bob!" the baggageman said.

He glanced at the address on the envelope. "So yo' sendin' a story way to Pittsburgh?" he queried.

"Yes, sir! Don't lose it!"

"Yo' bet I won't. Pittsburgh, eh? Say, be yo'-all the reporter that come down a lookin' for Jerry Fander?"

"Yes—but—"

"Did yo' find 'im?"

"Say, old man, you won't give it away?"

"Suttinly not! I got a boy into the newspaper business—but he's peddlin' papers. Not a word, suh, on my honor!"

"I found him—and he's all right!"

"Ho law! Well, yo's shore in luck! I 'lowed that feller 'd be'n killed up by them riveh pirates. They's mean, yassuh—well, Bob's gittin' restless. So long, suh!"

They shook hands.

"Good-by! See you again!" Walts smiled.

"Good-by! All right, Bob! Let 'er go!"

With that, the train started and pulled away, carrying on board the most precious mail that Reporter Walts had even dreamed of.

Walts had finished his day, and in the exuberance of his satisfaction he went to a hotel and had dinner. While he waited for his meal to be brought on, however, he felt the fatigue that at last was overtaking his inspiration. As he ate, he found himself growing more and more weary. He had toiled as never before.

His return to the motor-boat down at the landing was at the stumbling gait of a drunken man. On board he cast loose, ran the boat across the river in the teeth of the wind and rain to the head of the bar in Rosedale Bend, anchored in the shoal water and crawled into his cabin to sleep.

It seemed to him as though he would never complete his final necessary motions of making down his bunk and taking off his clothes, putting on his pajamas and covering himself up.

He had been on the alert for more than thirty-six hours, and he had worked at top speed for twelve hours, and then had become his own messenger boy for many hours. Now he let go and slept! His very soul slept with dreamless satisfaction.

It was daylight when he awakened again, rested, but with his head whirling with the memory of the work done. He looked out, but for a minute he could not tell whether it was the day he went to sleep or not.

He remembered that when he turned in, in midafternoon, he had left the rain pouring down, the sky black with dull clouds and the wind driving along. Now the sky had cleared, the cabin was raw and cold, without a dry gale was blowing, and the sun was shining out of a clear blue sky.

It was a cold, autumnal gale, straight out of the north. He could see his breath. When he awakened fully he felt the slight quiver of the little centrifugal pump still whirling around, driven by the slow motor. It was running dry, of course. He stopped it the first thing.

Then he dressed himself, cooked breakfast and wound up his stopped watch. It was two or three hours after sunrise, which showed that he had passed through a night in his sleep.

"Now for the second story!" he smiled to himself. "I'll just go right back to the lake and have another talk with Jerry. I wonder what his game is—what he expects to do? I'd like to know about that!"

Lifting his anchor, he returned down to Arkansas Old Mouth and returned up to Duck-hunter Bayou, waving a greeting to the shanty-boaters who looked at him from stern decks, or waved their hands from windows. He was soon in the Ozark Old River Lake, and coasted along the north shore and opposite the little bay in which Mrs. Wooten had moored her boat. Mrs. Wooten was just clear of the bay, which was only six or eight rods long, and hardly more than a dent in the bank, rowing in her skiff.

"Hi-i-i!" she called to him. "Come heah, won't yo'?" He stopped his motor and steered in. She came alongside.

"Mr. Walts—I 'low that's yo' name, suh—have yo'-all seen my li'l' gal, Tressy? She went out, an' she ain't come back, sencet the storm broke, suh. Lawse! Lawse! I'm afeared! I'm afeared! Hit's be'n a blowin', an' the waves has be'n high, an' hit's mean in yeah! Lawse! I neveh thought; but theh's mean, mean men in these yeah back bayous!"

"Not seen her since yesterday!" he asked.

"Not sincet day befo' yistehd'y, suh! I'm 'most sick, waitin'! Watchin'!"

"I saw her day before yesterday!" Walts exclaimed. "She was up there by that bayou, leading in to where the pirates had the Fairy Land—"

"Sho! That's Delp's bo't yo' got, theh?"

"Yes. Fander tricked the pirates and had them chained up, the same way they had him chained up—"

"Yo' say he did!"

"Yes, he had them."

"But why didn't he bring them out?"

"I don't know. He had some scheme—"

"Lawse! Lawse!" she moaned. "The man er chain never was that could hold them two pirates! They's come clear, an' they's—I bet they's caught my Tressy! I know they has! I don't know—I—I'll kill them fellers. Are yo' game, mister? Yo' got the nerve of a cat—er anything?"

"If there is anything I can do—if you know what to do, we'll do it!" he said sharply. "We'd better run your skiff into your boat there, and then we'll go in and see—"

"Yassuh, an' I got a gun—I got a rifle fo' yo'!"

"I have a little high-power myself."

They hurried into the cabin-boat, rid themselves of the skiff, locked the cabin-boat's doors and then crossed at top-speed to the entrance to the bayou labyrinth.

As they entered, Mrs. Wooten stood up behind the motor-boat's cabin, and rested her rifle along the roof while she held her buckshot loaded automatic shotgun ready in hand.

At half-speed they turned and twisted through the bayous, Walts picking the general course, while she warned him of sunken logs and shallows which adjoined the channel through which they had to make their devious way.

Thus they came to the landing, which Walts recognized. He led the way across on the dim new trail over the peninsula-neck through the woods to the bayou opposite. But when they arrived at the bayou he stopped at the water's-edge and looked up and down and across—in vain.

There was no mistaking the place.

"It's gone!"

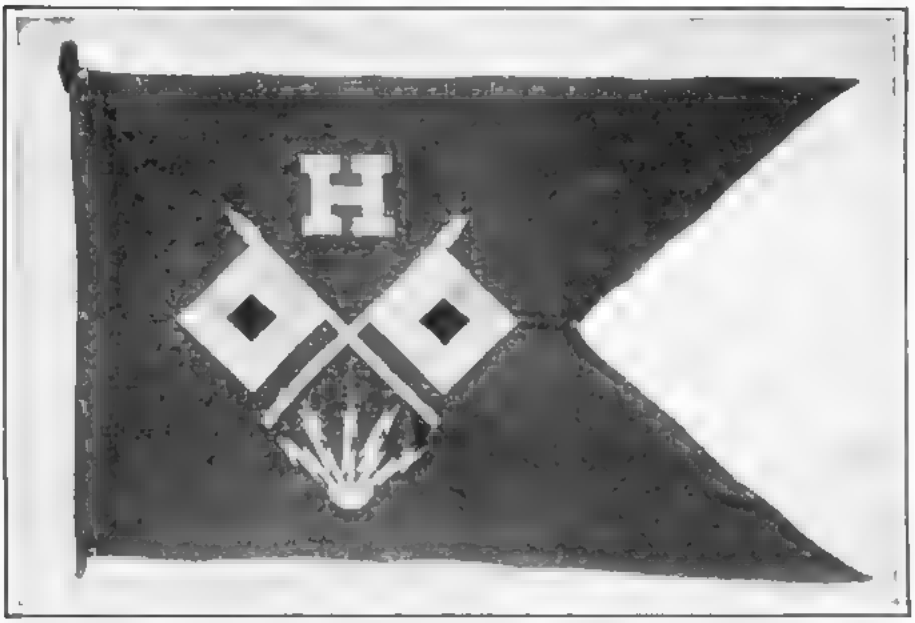
He turned and said to the woman:

"This is where they had the Fairy Land moored, but it's gone! I can't imagine—"

"Lord!" the woman exclaimed, her face whitening. "An' my gal with them! I'll kill them scoundrels, if I have to follow them to the Gulf of Mexico, er into Cajun Country!"

(To Be Continued.)

THE TELEGRAPHER'S BATTLE-FLAG.



UNDER THIS GUIDON MANY COMPANIES OF PATRIOTIC TELEGRAPH OPERATORS ARE "DOING THEIR BIT" TO HELP UNCLE SAM WAGE HIS STRUGGLE FOR THE WORLD'S DEMOCRACY

Help for Men Who Help Themselves

NUMBER 87.

DUPLEX TELEGRAPHY

BY SAMUEL W. BEACH,

Author of "Wireless Points and Pointers," "Simple-Circuit Telegraphy Explained," "Uncle Sam's Telegraphy," "The Dreadnought's Nerves," "The Navy Department Telegraph," etc.

IT seems as though every successful invention, based upon something brand new, immediately begets a family of little ones called improvements, with the agility and prolificacy of a guinea pig, and these improvements, like the baby pigs, drain their sustenance from the parental fount until, at the weaning, the elder has become almost unrecognizably emaciated, while its offspring, fat, sturdy, and impudent, dig out into the world independently, leaving the old folks at home to do odd jobs.

Farmer Pioneered.

So it has been with the telegraph. Barely seven years after Professor Samuel F. B. Morse perfected the first simple circuit between Washington and Baltimore, Mr. Moses G. Farmer, of Boston, who had already experimented with simple repeaters, sprouted forth with a scheme for loading a wire with two messages at the same time, one traveling in one direction and the other oppositely.

Farmer is credited with having wrung some local successes with his apparatus in short circuits.

He employed at each terminal of the circuit a synchronous disk, like the commutator of a dynamo. These disks were to whirl at high speed at opposite terminals any number of miles apart, with not a hair's breadth of difference either in rate of revolutions or relative positions.

At each terminal there were to be two sets of Morse apparatus, so connected by a species of brush contacts with the whirling disks that, while those disks opened and closed the electrical circuit, say, one hundred times per second, the pulsations were too fast to be noted by the clumsy sounders of the times. The disks were in reality split by insulation slightly out of line, each half adjusted to deal only with its own key and sounder. The disk at the other terminal was likewise.

Required Nice Timing.

Should an operator at "A" desire to send a message and close his key to make a dash, the half-disk to which his brush connected would pass under the brush perhaps fifty times, each time sending an electrical impulse to the opposite half-disk, which must be so nicely timed that every one of the fifty impulses jumps through the brush

at " B " and holds the sounder-bar down. Should " B's " partner want to send while he is receiving, he, using the other Morse set, closes his key to make a dash. His brush contacts with the other half of their disk and the corresponding half of the distant disk, and hence into the Morse set of " A's " partner.

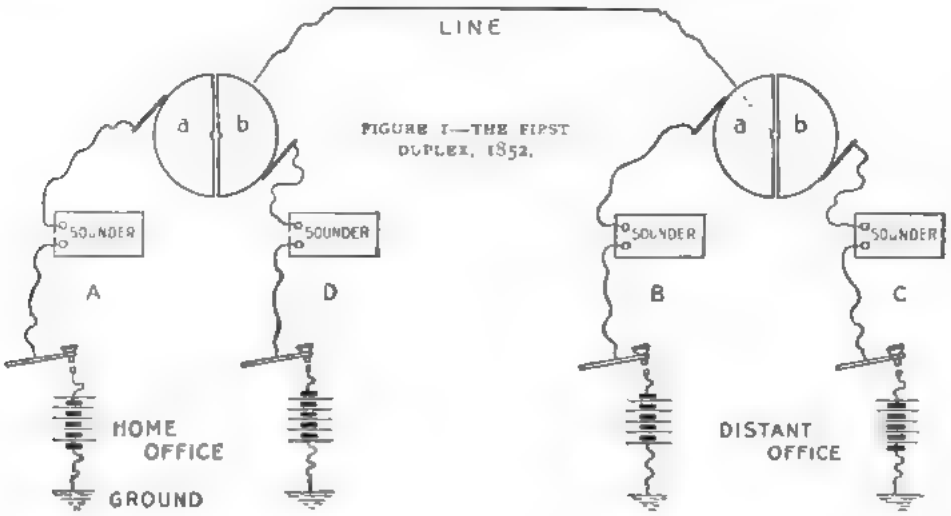


FIGURE 1—THE FIRST DUPLEX, 1852.

So it is seen that Farmer's idea was a current that pulsated with great rapidity, one pulsation for one set of Morse apparatus, and the one following for the other set, and so on.

In truth, such a system cannot be rightfully called simultaneous transmission such as we now have, and it failed, although as late as 1873 an engineer named Meyer exhibited an improvement on Farmer's idea, in Vienna.

Even as Farmer was still fussing with his disks the director of the Austrian telegraphs, Dr. Wilhelm Gintl, brought forth, in 1853, a multiplex telegraph based upon the very principles still in use.

Gintl's Novel Key.

Gintl brought into play a relay with magnet cores wound differentially; *i. e.*, two windings in opposite directions. Just like the differential magnet that I described in " Simple-Circuit Telegraphy Explained," these cores became demagnetized whenever two currents traveled through the windings, one in one direction and the other oppositely.

Gintl brought forth something novel in telegraph keys for his duplex apparatus. His key had two levers perfectly insulated from each other, both provided with front contacts, and one with a " ground " or back contact.

Two sets of batteries for each terminal of the wire, each precisely the same in strength, completed what was destined to be the nucleus for almost all subsequent inventions in the line of multiplex telegraphy.

The left front contact of the double key opened or closed one of the battery circuits, which went no further than to electrify one of the differential relay windings at the home station. This was called the local circuit.

The right front contact of the same key threw on or off the main-line battery, which not only electrified the other differential winding, but continued out on to the line and to the distant station, where it entered one of the differential windings of that station's relay, causing a signal.

Now, both of these front-key contacts had to close or open simultaneously, because they were connected by a horizontal strip of insulation, in the center of which was a knob for the operator to grasp.

" Should " A " close his key to make a signal, his main-line " juice " skedaddles

through the windings of the home relay and onward to " B "; but in passing through its home cores it fails to magnetize them, because his local " juice," traveling around the same cores in an opposing direction, completely neutralizes the magnetizing efforts of the other.

So, " A's " relay remains inactive, while " B's " relay responds.

When " B " Closes to Signal.

So far, so good. Now, maybe " B " wants to send at the same time that " A " is coaxing Morse his way.

" B " closes his key to make a signal. His two batteries fail to flicker " A's " signals coming in at " B's " home relay, because they, too, have done some neutralizing.

But now something else happens. Both stations have their cumbersome keys closed. The main-line power that each thus starts to send into the one line come from the same polarity.

That is, each main-line battery has its negative pole to the ground and its positive to the line. The best-known law of electricity is that like polarity repels, while unlike attracts.

Therefore, the instant both keys are closed at the same time, and as long as they continue closed, there will cease to be any current whatever flowing through the main-line wire; the main battery windings of each relay will be figuratively dead, and each local battery current, now unopposed, will magnetize its own home relay.

At this period—this seems paradoxical—each local battery is actually making the signal that its mate, miles away, is making for it—sort of a fifty-fifty game.

Let us now suppose that " A's " signal is finished, and he opens his key. His relay still remains closed, because " B " has not yet finished, but the relay at " B " opens, terminating " A's " signal at " B."

When " A " opened his key his main-line current stopped repelling the main current of " B," which, now unopposed, leaps through the main winding of " A's " relay and keeps it magnetized. With the opening of " A's " key his local battery ceased work, it should be remembered.

There we have the first genuine duplex telegraph. I have described it minutely, perhaps too exactly to be of interest, excepting to those who are conscientiously striving to learn the whys and wherefores of telegraphy from the ground floor to the top story.

I most emphatically recommend to these latter that they reread and restudy the work of old man Gintl until their minds picture the theory of his duplex perfectly.

That awful key of Gintl's proved a stumbling-block. It took too long, when opening from a close, before the back contact grounded the incoming main-line signals.

Only a tiny fraction of a second, to be sure, but that was time enough to knock incoming signals into a cocked hat unless the sending was extremely slow.

Too, it was found to be a nearly impossible task to keep all batteries of exactly the same strength. If the operator at " A " were peeved, he could, by deliberately holding his key half-way between closed and open, kill " B's " signals altogether—something that is now absolutely impossible.

Poor Gintl had only one year of triumph. In 1854, Carl Frischen, a telegraph engineer of old Hanover, hustled forth with an improvement. In fact, there are wiser men than I who give Frischen the glory of the first real duplex.

I cannot agree, for I believe the differential relay to be the groundwork of all, and surely Gintl seems to have been the first to adopt it. And Gintl's duplex worked—albeit powerfully slow.

Frischen's Foxy Rheostat.

Friend Frischen disdained the double key, and threw that local battery to the trash-heap. To do this he broke out a " rheostat " consisting of a series of resistance coils subject to being cut in or cut out by the insertion of metallic plugs.

By referring to the accompanying diagram it will be plainly evident how smoothly this rheostat took the place of that extra key contact and that expensive local battery.

To describe a rheostat, such as Frischen used, it is sufficient to explain that electricity seemingly flows like water. If a

definite amount of water is forced at a certain pressure through a large pipe, it will pass far easier than through a small pipe. The small pipe resists the flow more than the larger.

The resistance of wire of various sizes to a flow of electricity is measurable just as the opposition of pipes of different capacities to the passage of water, so that if five

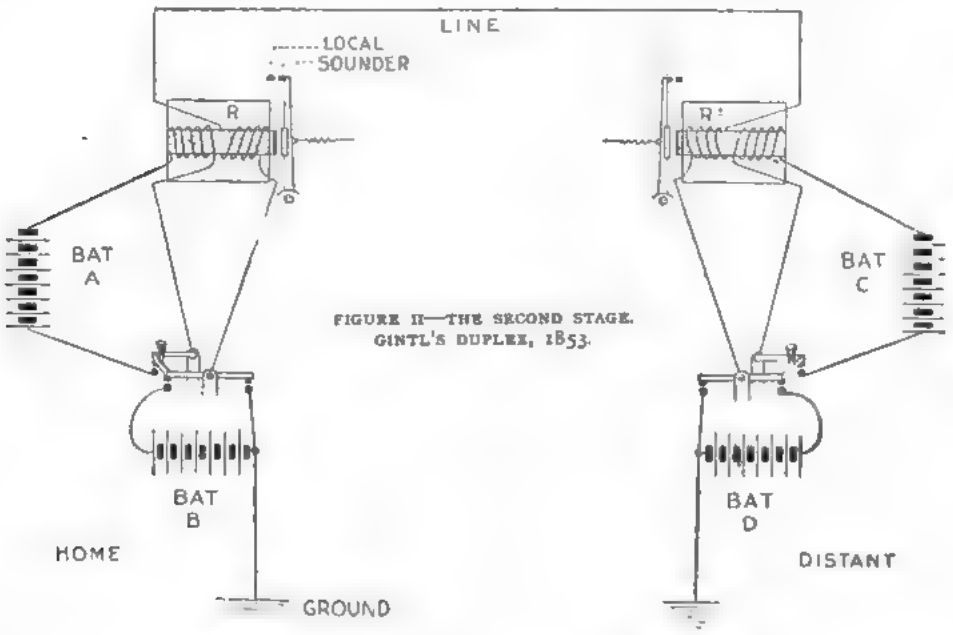


FIGURE II—THE SECOND STAGE. GINTL'S DUPLEX, 1853.

coils of wire of a predetermined size offer a certain resistance to a current of electricity passing through them, it is plain that, by inserting plugs between in such a way as to cut out one of the coils the resistance will be reduced one-fifth; two plugged out would decrease it by two-fifths, *et cetera*.

Professor Frischen utilized a peculiar phenomenon of electricity—namely, that if a current starts flowing over a line and meets a point where that line divides into two wires each of exactly the same size and length, and so of the same resistance, it will itself divide, and each half will flow along their new paths

Fooling the Current.

A duplex using two wires would be an expensive joke, so Frischen proceeded to put one over on the current by fooling it into believing that it was dividing and flowing impartially over two equal paths.

He did this by inserting a rheostat, or adjustable resistance box, so that one of the two wires, instead of traveling alongside its mate over the dreary hills and dales to the distant station, immediately entered this resistance box where it encountered numerous coils of small wires which upon proper adjusting by plugging, offered a resistance to its flow exactly equaling the resistance the current would have encountered had it covered the entire line with its partner.

This rheostat circuit is known as the "artificial line."

From the trunnion of the key a wire leads to the relay. Hence it splits, one-half coiling about the relay cores from right to left, and the other from left to right, creating a differentially wound magnet.

From the relay one of these wires becomes the main line, swings to the peaks of poles, and enters the distant station where it becomes one of that station's differential windings, and then, joining that office's artificial line, connects finally to the key trunnion there.

The other half-winding at the first station enters the resistance box, leaves it, and goes to the ground.

Let the home-station key close to send a signal. The positive pole of its main-line battery sends forth a current through the key, through the differential windings and main line and artificial line.

The home magnet is not affected by either current passing around it, and the relay remains open; but the relay at the distant station, where the key is still open and no artificial line at work, closes with a bang.

Takes Figuring, This!

Should the other station desire to send, and closes his key to signal, his battery current, of the same polarity as that of its correspondent, promptly combats and completely stops traffic all along the line, so that both artificial lines shift for themselves for the moment, and each magnifies its own relay in order to accommodate the other.

Should Tom finish his signal and open his key, his artificial line goes dead, but his relay is still held down, because Dick's current, no longer fighting Tom's, jumps into the latter's relay by the front door just as Tom's artificial-line current is leaving by the rear entrance.

The instant Dick's main line current gets busy it fights a rear-guard skirmish with its own artificial line, neutralizing his relay, which opens in obedience to Tom's distant key. We wonder how in old Harry Mr. Frischen thought it all out.

Ah, but our worthy man failed to improve on Farmer's apparatus in the matter of speed, and his key could be held half-open and half-closed.

Now let's talk "shop" for fair. We're coming to a sure-enough duplex, and one that is still in use, although slowly going the way of Sitting Bull, the five-cent loaf, and yesterday's salary check.

Boston again bobs into print as the home of Joseph B. Stearns, who, in 1868 handed to telegraphic history the first duplex that would work successfully at high speed. His apparatus is substantially the same as that of brother Frischen, but he relegated the lordly key to the menial work of simply operating a transmitter, through a local battery of a couple of cells.

This transmitter makes a noise — that tickles the American sending operator. And this transmitter, as its lever wags up and down in response to its key, itself acts as a key to the main line, and by a little trigger arrangement, manages to connect its main-line battery to the business in hand, we will say, half an instant before the ground-connection is released, entirely eliminating that moment of nothingness which prevailed when Frischen's key swung from open to close.

Did you ever start out of the house on a dead run to meet the 6.58 accommodation, find that it is pouring down rain, and thereupon turn and dart back after your umbrella?

Well, an electric current is just as anxious to get back under cover when it finds itself at the end of its tether. Maybe it has traveled a hundred miles.

Just the same, if the key that started it suddenly opens, that current frantically rushes back home, much weaker, of course, from the exertion, but still strong enough, in the case of a Stearns's duplex, to create a flutter in the home relay known as a "false signal."

It was not until 1872 that, while experimenting with his duplex upon a line between New York and Buffalo, Mr. Stearns perfected a contrivance that effectually stopped false signals.

Between the front door and the back door of the artificial-line's rheostat, be placed a large, adjustable condenser, consisting of alternating sheets of tinfoil and paraffin paper.

Let's call the artificial line, as it passes around the relay cores, the "left-hand winding," and that of the main line, the "right-hand winding." The transmitter has opened, no current flows forward, the relay is open.

Forestalling False Signals.

Then the current comes rushing back into the right-hand winding and threatens to magnetize the core and thus, by attracting the armature, to cause a false signal. All this happens almost upon the instant that the key has opened.

A tiny portion of artificial-line current

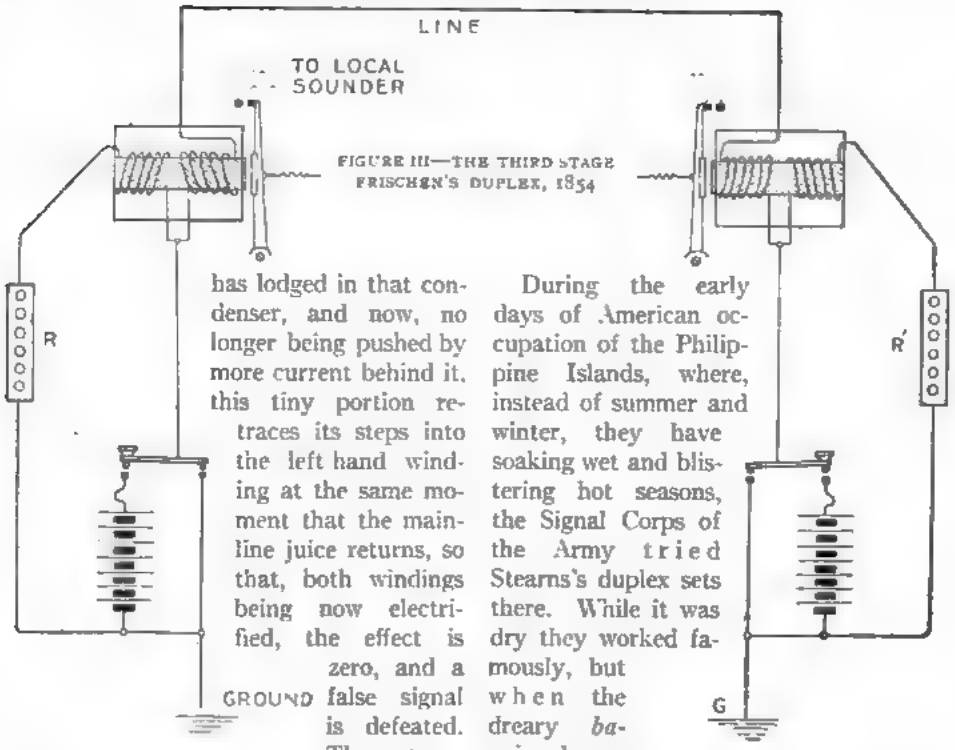


FIGURE III—THE THIRD STAGE FRISCHEN'S DUPLEX, 1854

has lodged in that condenser, and now, no longer being pushed by more current behind it, this tiny portion retraces its steps into the left hand winding at the same moment that the main-line juice returns, so that, both windings being now electrified, the effect is zero, and a false signal is defeated. The returning current from the main line is termed "static."

Before taking up the last word in duplex telegraphs, let us go back to the humble overhead wire, strung from pole to pole along a highway. The wire is fastened to glass knobs which insulate, so that in dry weather there is practically no loss of electrical current through leakage.

Now comes along a heavy fog or a rain spell. Every insulator is coated with water, which is a fair conductor, and the poles are soaked, so that at every insulator a tiny bit of current leaks down into the ground.

Doesn't Work Well in Rainy Weather.

An ordinary American closed circuit spreads this leakage out over the entire line to a large degree, because each terminal has a full main-line battery; but a Stearns's duplex is not thus favored, and in rough weather it is necessary to be almost continually "balancing"; that is, putting in or pulling out rheostat plugs in order to keep the resistance of the artificial lines exactly the same as that of the rapidly fluctuating main line.

During the early days of American occupation of the Philippine Islands, where, instead of summer and winter, they have soaking wet and blistering hot seasons, the Signal Corps of the Army tried Stearns's duplex sets there. While it was dry they worked famously, but when the dreary *baguios* began —up they went—and it rains a whole lot, too, in the Philippines.

When, later, we discuss quadruplex apparatus, we shall recognize in the "common side" thereof the principle of the Stearns duplex, and then we shall cease to wonder why, during rainy weather, the common side has so often to be abandoned altogether.

No telegraph circuit which depends for its existence entirely upon an increase and decrease of current flow can be entirely free from weather conditions.

In the year 1873, Mr. Thomas A. Edison, the "Wizard of Menlo Park," invented something new in duplex telegraphs, and thereby happily hit upon the foundation for quadruplex telegraphy whereat four operators at each terminal may work over one wire, and that wire need not be any larger than a gnat's eyebrow, either.

Edison used apparatus at "A's" end of the wire which did not open the line, but, instead, fed it with a constant current, the direction of which was changed by depressing or releasing the key. At "B" this constant current fed into a polar relay,

which responded only to changes in direction.

When " B " closed his key to send, however, he affected the quantity of " A's " current increased it—and " A's " relay, which didn't care a cent what direction a current took through its magnets, bowed instantly to this change in strength.

Watch closely the diagram on the next page.

How It Works.

When at rest, " A's " key is open (and " B's," too). " A's " key manipulates only a transmitter which acts as the main line key peculiarly a key that is never " open."

The lever of this transmitter being upon its upper, or back contact, a little trigger, pivoted where the ground-wire comes in, no longer held down by a closed transmitter, has bobbed up and connected the ground wire to the *positive* pole of a main battery—we will call it the right-hand main battery.

In so doing the left-hand main battery is rendered useless, because the opening transmitter has parted company with the ground connection; but the right-hand battery now brought into play shoots forth a current of *negative* electricity.

Now, then, there comes a peculiar relay which few other than an Edison might have thought out. It has two coils, entirely independent of each other

They face together, one an inch or so the higher, while between is an elongated tongue, with local sounder contacts at its tip-top end like an ordinary relay tongue. This one, however, is pivoted between the upper right-hand coil and the lower left-hand coil, so that no matter which magnet attracts, the effect is to pull at the relay tongue in an endeavor to swing it to a close; but this effort is rendered abortive by a slightly stronger pull of the relay spring in an opposite direction.

When the Transmitter Is Open.

Now, then, the transmitter is open, and throws *negative* electricity to the line which flows over the dreary miles to the polar relay to be described later at the distant station, and the function of which is to respond only to differing kinds of current.

Manifestly, when " A " opened his key he wanted the sounder at " B " to open likewise; therefore, the distant polar relay is so wired that a negative flow through its coils throws the relay tongue upon its open, or back contact, with relation to the local-sounder circuit connected to it.

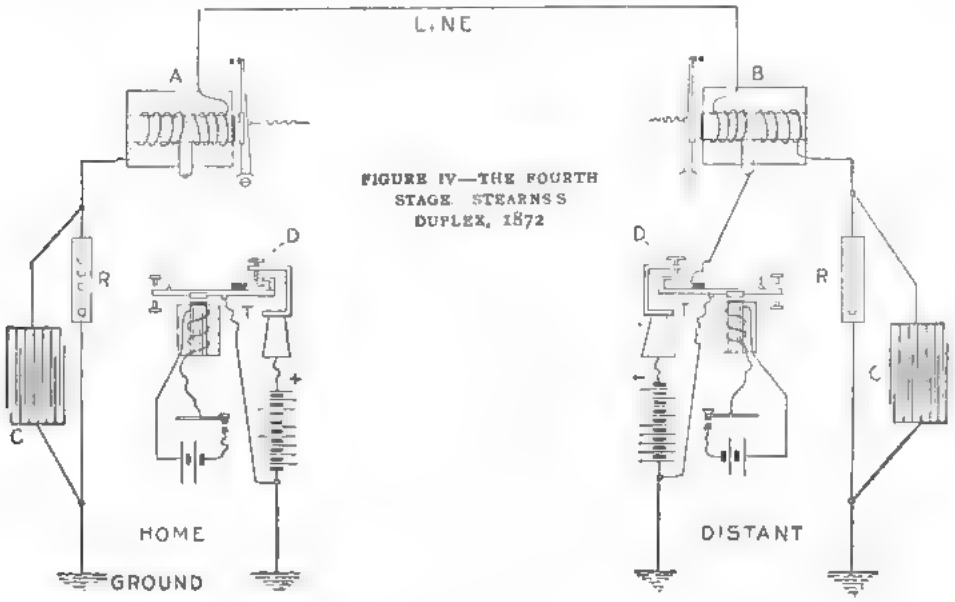


FIGURE IV—THE FOURTH STAGE STEARNS'S DUPLEX, 1872

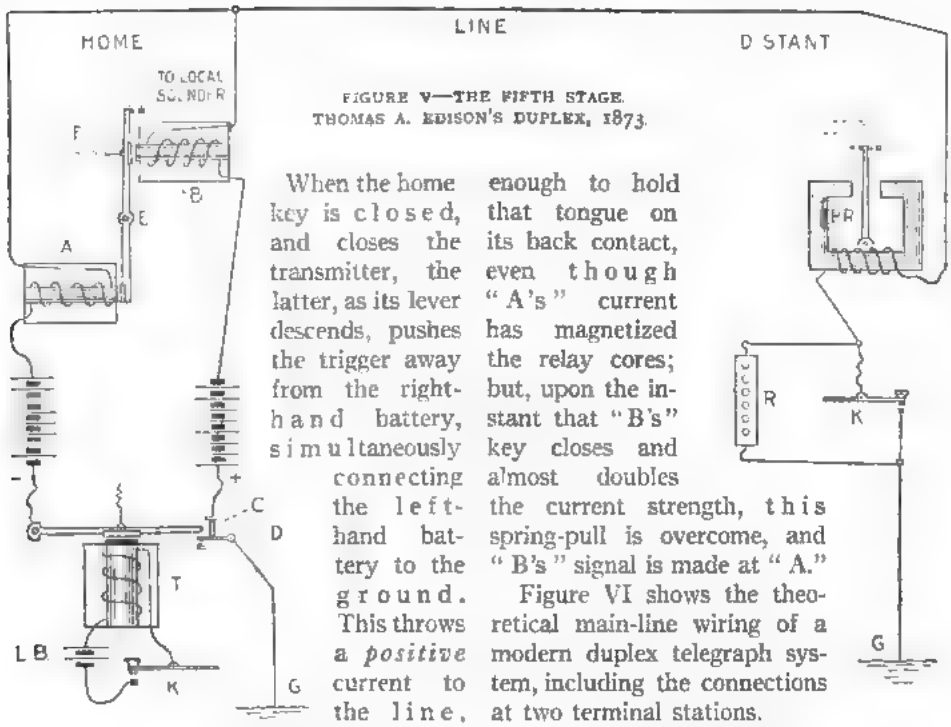


FIGURE V—THE FIFTH STAGE.
THOMAS A. EDISON'S DUPLEX, 1873.

When the home key is closed, and closes the transmitter, the latter, as its lever descends, pushes the trigger away from the right-hand battery, simultaneously connecting the left-hand battery to the ground. This throws a *positive* current to the line, which reverses conditions at "B's" polar relay, throwing its tongue to contacts that close the local sounder circuit.

In short, "B's" polar relay doesn't care an Oshkosh darn how much current flows through its cores, but salutes obediently every change in the direction of that current, while "A's" relay quivers in fright when the current strength varies, but cocks its nose disdainfully when that current merely changes its character.

Let now "B" close his key to send a dash to "A." The route from "B's" polar relay to his ground wire passes through a rheostat that adds a mile or two of resistance which "A's" currents have to overcome before they come to their final resting-place; *i.e.*, the earth at "B." "B" has his key inserted between the family entrance and the Sunday exit of this rheostat, so, when he closes his key, he cuts off all of the resistance in that rheostat, thus instantly greatly strengthening the line current.

Let me go back a line or two and explain that the spring pulling at the tongue of "A's" relay is set at a tension strong enough to hold that tongue on its back contact, even though "A's" current has magnetized the relay cores; but, upon the instant that "B's" key closes and almost doubles the current strength, this spring-pull is overcome, and "B's" signal is made at "A."

Figure VI shows the theoretical main-line wiring of a modern duplex telegraph system, including the connections at two terminal stations.

PC in each case represents the transmitting pole-changer, and PR in each case represents the polar-relay at each station.

Although the battery type of pole-changer is shown, it is understood that to-day the battery is replaced by two motor-generator sets, and that modern pole-changers, although the same principle as that illustrated, have armature tongues which are mounted vertically instead of horizontally.

Wonderful Modern Apparatus.

In Figure VII the old-time gravity main-line battery is shown replaced by motor-generators at each station.

It will be noted that at each terminal station one of the generators has its negative brush connected to ground, and its positive brush connected to one contact of the pole-changer, while the other generator at the same station is connected in the reverse order.

In practise, a 300 or 600 ohm coil is inserted in series with each of the wires extending from the contacts a, b, and c.

The modern polar duplex telegraph appa-

ratus, designed to act upon changes of direction, or polarity, of the line current, rather than upon variations in quantity of that current, was the next step in duplex history, and so perfectly does it fill the bill that very often during hard rainstorms every-day Morse single circuits that have "gone up" because of excessive leakage along the right-o'-way, are restored to usefulness by duplexing them.

The diagram of a polar duplex takes on a rather complicated aspect. But don't lose heart; the worst is yet to come when we begin to tinker with quads.

The apparatus at each station include a key, which through a local battery works the transmitter, the latter acting as a pole-changer; that is, dishing out positive or negative current to the line as desired. Then each station has a polar relay to catch incoming signals, its tongue acting as a key to a local receiving-sounder through a second local battery.

And lastly, both "A" and "B" have condensers to combat static, and resistance boxes for balancing their artificial lines.

There are several types of polar relays for duplex work, but they all arrive at the same result, and a theoretical description is sufficient.

There is a large, permanent magnet so placed that it imparts a constant magnetism – that of its "north pole," we will say, to the relay's electro-magnet cores, and that of its "south pole" to the relay's tongue.

Electro-Magnets Wound Differentially.

The electro-magnets, of which there are two, are wound differentially, and so arranged that the business ends face each other an adjustable distance apart, while between them swings the tongue.

When there is no current in the differential windings, it is plain that their cores exert a north-pole pull on that defenseless little south-pole tongue; but as the two north poles face each other, the south pole will remain on a "dead center" between them, unless the tongue is held slightly to one side by the adjustable position of its contact points, in which latter case, or if one of the differential cores is screwed up closer than its companion, the tongue will abandon neutrality and beat it toward the stronger pulling core.

So a polar relay needs no retractile spring like that of an ordinary relay.

When at rest the transmitters of both "A" and "B" are upon their back contacts, consequently the same pole of each main-line battery is to the line, we will say the *positive* pole. Both batteries are supposedly of equal power, and therefore, in accordance with Hoyle's rule, that like repels like electrically, the main line is not electrified.

The artificial lines at "A" and "B," however, draw their rations of juice from those same batteries independently—that is, no overhead wire connects the two artificial lines—so each artificial line is electrified and magnifies its home polar relay, *positively*.

As both home and distant keys are open, neither station is signaling, so the contacts of their respective relays are so arranged that when, as in this instance, the relay tongues are pulled positively, they are upon their back contacts with relation to their local sounder circuits.

What to Do for Reversed Signals.

Sometimes it so happens that signals come in reversed. That shows that the tongue contacts are reversed.

A small switch is generally arranged upon the base of each relay, the throwing of which, one way or the other, instantly reverses the contacts and cures the complaint.

Now the home station starts to send by closing his key. This closes his transmitter (pole-changer), which swaps ends with its main battery and now throws negative juice to the line.

In further obedience to the rule that unlike currents flock together, the negative current from "A" now flows merrily to "B."

It would seem that, now that a current is passing through both the artificial winding and the main-line winding of the home relay, and in opposite directions, there should be no magnetism in that relay's core at all, the two neutralizing each other's efforts.

This is not the case. Half of the current from "A" is still passing through its artificial line, we will say, in a direction right

to left, and half is passing around the same core from left to right; but that latter half is now being boosted by the addition of "B's" battery, because "B's" battery no longer opposes, so the added strength of current passing through "A's" main-line coil not only neutralizes the comparatively feeble efforts of its artificial winding to oppose it, but actually overwhelms the latter, and magnifies the home relay cores exactly as they were before "A" started to send.

"A's" sounder, therefore, remains idle, although, as we shall see, "B's" sounder clicks shut.

Remembering that while the keys of both stations were open there was no current flowing over the line, but that the respective artificial lines were keeping their relay tongues upon the open, or positive contact, because each key was throwing positive juice to them, it will be readily understood that when the reversed current of "A" enters the relay at "B" with double strength, it overpowers the artificial line windings and, pulling oppositely, throws the local sounder contact tongue over to a "close."

We know now that when both keys were open and the main line was electrically dead, the transmitters were throwing *positive* currents to the artificial windings, which, in turn, were pulling the relay tongues to their positive or back, or open, contacts.

It is plain, then, that were both keys closed, closing their respective transmitters, which in turn swapped battery poles, the main line would again be dead, but the artificial lines would be charged with a different kind of electricity, and that their action upon their respective relay tongues would be opposite.

That is the case. When both the home and distant stations close their keys, their artificial lines throw the relay tongues to a close, instead of an open.

At that moment, in reality, "A" is making "B's" signal, and "B" is making "A's" signal upon their own respective relays.

"Mux" Theory Hard to Grasp.

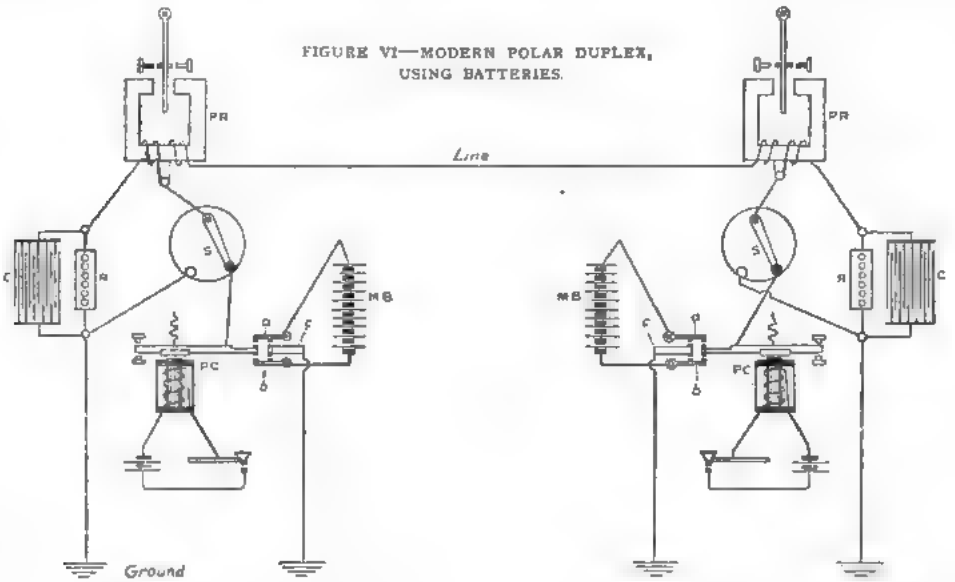
It is, indeed, difficult to explain the more or less intricate workings of multiplex telegraph apparatus so that a student may readily grasp the ideas.

I have always found it much easier to grasp the "last word" in any particular system after I have gone way back to the very first word and then watched carefully each little step, each tiny improvement that was brought to light until that aforesaid last word was given to the world.

I've tried to do this in depicting the duplex. I trust that I have written plainly.

I must await a future opportunity to

FIGURE VI—MODERN POLAR DUPLEX, USING BATTERIES.



probe into quadruplex apparatus with you boys. Let me finish this article with a brief description of how to "balance" a polar duplex.

It must be plain that no matter how carefully the modern dynamos or other sources of electrical current supply at the various stations are calibrated and groomed, it is almost impossible to keep such sources of juice supply, maybe hundreds of miles apart, the same, exactly to a volt at all moments.

One may fall behind; the other may gain. In either case they will affect the duplex apparatus to which they are harnessed. Should both batteries be throwing positive currents to the line, they fight each other, and they must scrap with equal vim in order to insure a perfectly "dead" line.

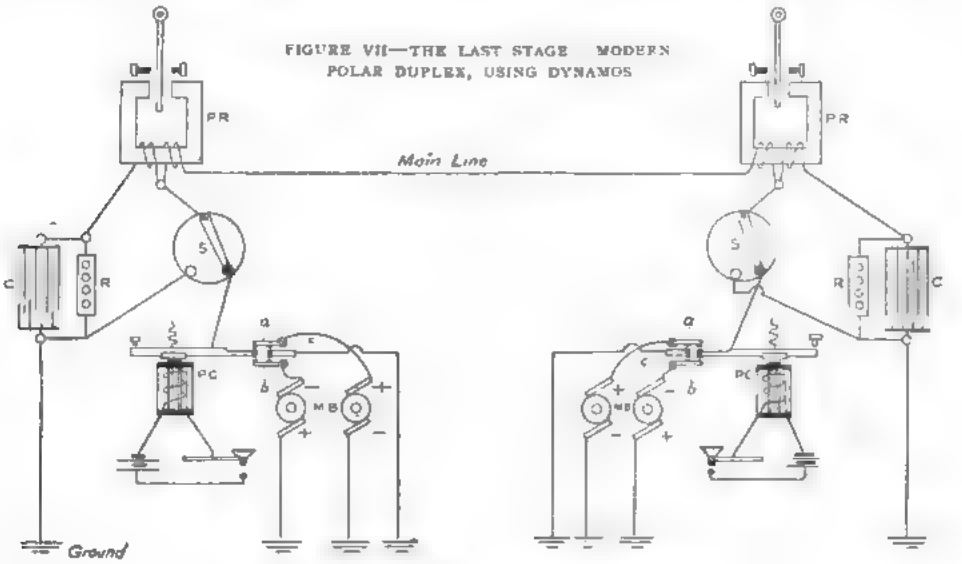
"If one is a tiny bit the stronger it will produce a like quantity of current in the line, the effect of which will be to create flutterings or false signals.

A set of polar duplex at Jonesboro may be working with Jonesville, fifty miles distant, one minute, and then cut in to a line to Jonesburg, a hundred miles away, the next minute.

It is plain, therefore, that the amount of "static," or returning current in the Jonesburg circuit will be approximately twice as great as that in the line to Jonesville. So it is equally plain that a "static" balance is necessary.

The wire to Jonesburg is twice as long, and presents twice the amount of resistance than does the line to Jonesville. The artificial line at Jonesboro must offer exactly the same resistance to its current as does its partner of the main line, so that artificial line must be balanced.

FIGURE VII—THE LAST STAGE MODERN POLAR DUPLEX, USING DYNAMOS



As soon as the circuit is made up, Ike Murphy, the wire chief at Jonesboro, asks his compatriot, Gottlieb O'Brien, at Jonesburg, to "ground." O'Brien throws a three-point switch which disconnects his pole-changer and battery from the line and throws the latter to the earth via a small resistance box. Isaac does the same stunt at his end.

Teamwork Between Murphy and O'Brien.

Murphy now sees that the tongue of his polar relay is absolutely on a dead center, there being no current from either terminal, so that if he pushes that tongue to either side it will remain there. That shows that his polar relay is exactly balanced.

Murphy now throws back his three-point switch, thereby putting his battery to the line through his transmitter (pole-changer), and then he slowly operates his key.

If his polar relay responds, it is plain that the current passing through the right-

hand winding of his relay and hence to the line is creating a greater or less magnetic effect in the relay cores than is that flowing through the left hand, or artificial line, winding, so they are not properly neutralizing.

This is because the resistance offered to the main line is not the same as that of the artificial line. Maybe there are not enough coils cut in the rheostat, in which case the current takes the path of least resistance and more will flow through the artificial than through the main line; or there may be too much resistance offered by the rheostat, so a greater flow will divert to the main line

In either instance Murphy plugs in and out of the rheostat until, with his transmitter working, the tongue of his polar relay will not show a flicker of response.

Now that Murphy knows that his polar relay is in working trim, he feels for "static," by making a series of rapid signals. If he hears a slight false signal, he eliminates it by readjusting the plugs in his condenser.

Jonesboro is now balanced with Jonesburg, and Murphy throws his battery off again so that O'Brien can go through the same performance. Then they both "cut in," and their regular operators begin business, "Biff" Davis', at Jonesboro, sends to "Fine Business" Lovett, at the burg, and "One-Eye" Lewis, sitting next to Lovett, sends to "Dick" Turpin, at the boro, all over the self-same wire simultaneously.

OUTCLASSED.

BY C. L. FUNNELL.

"AN op may take to firing, and a lineman learn to knit,
And a braky may conduct a dancing course—
But an eagle-eye like me ought to have the sense to see
That the place he doesn't fit is on a horse.

"Last week some friends insisted that I take a little ride,
And when they brought my nag I climbed his cab.
I took the straps for steering, but I felt the lack of gearing,
And I looked around for something I could grab.

"While we walked I kept my bearings; then the rest began to trot,
So I tried to make my equine pound the rail.
His throttle sort of stuck, and to add to rotten luck,
I reached to notch the Johnson bar and only pulled his tail.

"Then I kicked him in the boiler and submerged his floating rib,
And he started like he'd struck a falling grade.
With his safety on the pop, gee! I couldn't make him stop,
And I wished for Mr. Westinghouse's aid.

"But he had no air equipment, and he couldn't be reversed,
So I steered him for a wall of granite blocks.
When he reached the edge he stopped, and I flew and later flopped
On the realty beyond the wall of rocks.

"A call-boy may embroider, and a trackman take to golf,
And the word of mouth may supersede the Morse;
But an eagle-eye like me ought to have the sense to see
That he's not designed to operate a horse."

WAR-RAILROADING ON THE SOMME.

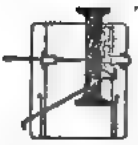
ONE OF THE BIG 164-MILLIMETER GUNS WHICH THE FRENCH SOLDIERS HAVE USED TO SUCH GOOD EFFECT IN ROUTING THE ENEMY FORCES.

BRIDGE BUILT OVER ONE OF THE CANALS IN THE SOMME REGION BY A BATTALION OF FRENCH ENGINEERS.

RETURNING YOUR LOST PROPERTY.

Crutches, Candy, and Cash Are Some of the Things Travelers Lose on the Train—Umbrella Thieves Scarce.

BY RICHARD WHITMAN.



IT is the nature of human nature in transit to lose things. It is the business of the carrier to return them, as far as possible. And the system, in common with all the commanding features of twentieth-century American railroad transportation, works thoroughly and well.

A visit to the lost and found department of a big modern terminal station yields many interesting side-lights on human nature. The big lesson which such a visit conveys is the innate honesty of humanity, a fact questioned only by the kiln-dried pessimist.

Yes, Most Folks Are Honest.

"You forgot your change!"

How often have you been called back to a store counter by this cry of a salesman?

The same principle applies on a railroad train. If you have inadvertently left a valuable parcel in a car, the chances are that it will turn up safe and sound in the lost and found department in the nearest city of size.

To see how the system works, drop in at the lost and found department of the Grand Central Terminal in New York. It is situated on the lower level of the concourse and peculiarly meets the need of the commuters over the Central and New York, New Haven and Hartford lines.

The office is small; the storeroom in the rear is far larger. Until the average of human memory improves, this proportion will be preserved.

Let it be remembered that this particular department caters mostly to forgetful commuters. The clerk in charge is kept busy all day long with a stream of passengers reporting losses or calling to claim property. It appears that men leave the most articles on the trains and women in the waiting-rooms.

The railroad men explain this difference. Men become absorbed in a newspaper or a game of cards and leave on the train the bundles their wives commissioned them to bring home.

When the wives come to the city they fidget in the waiting-room for fear of losing their trains, and leave their bundles or purses there.

Usually, however, through the triumph of the shopping instinct, a woman will hang on to a bundle and leave her purse or umbrella in the waiting-room. The year round, station attendants average finding ten to fifteen purses daily in the women's room, and on rainy days several umbrellas.

One of the most curious oversights recalled by those in charge of the department was the instance of an old lady who forgot her crutches. She arrived from the West in an invalid chair, and was taken to her home up-town in an automobile.

The crutches were found in the waiting-room and turned in. Strangely enough, they were not missed until the next day. The owner was required under the rule to identify them, which she did by telephone, and sent a servant for them.

The articles found on trains by employees are turned in from whatever point at which the run terminates. The office of the lost and found department is open from 8 A.M. to 6 P.M. daily except Sunday.

During that day articles which come in are cared for by men of the stationmaster's office, which has supervision over the lost and found department, and turned in to the department Monday morning.

The car department is required to exercise vigilant care on the trains to find and return lost articles. This care is matched by that of the "red-caps" and women assistants in the terminal waiting-rooms. Frequently these attendants turn in loose bills found on the floor.

The rapidity with which the system often works is illustrated by this typical incident. A commuter who arrived in the city on a morning train reported an hour later the loss of a straight-handled dollar umbrella, which he described. The umbrella had been turned in, and he signed in the big book and received it at once.

Every thirty days lost articles turned in at the various points on the suburban lines, and unclaimed, are sent to the central department for storage. They are kept for ninety days. If still unidentified and unclaimed they are turned over to the original finder.

A Hundred Articles Daily Turned In.

Upon an average of eighty to one hundred articles daily are turned in from trains and waiting-rooms. Inquiries for missing articles come from points all over the country.

Here is an instance of quick recovery. An attendant came in with a package left at the central ticket window.

"Looks like candy for somebody's best girl," he said.

He had no sooner left the room when in came a good-looking young fellow with an inquiry for a five-pound box of candy which he had left at that window. He received it and departed girlward with a happy smile.

Not always do the articles turned in come from train employees. Often they are turned in by fellow passengers, either from trains or waiting-rooms.

Fully ninety per cent of the lost articles reported are recovered, another striking commentary on the average honesty of human nature.

To the clerk is entrusted the details of a voluminous correspondence relative to losing and finding. The department receives an average of fifteen letters per day the year round, a side issue of the vast number of verbal reports.

Wrote 4 Letters to Recover 1 Collar.

One of the most interesting of the chirographical exhibits is a series of letters written by a man living up-State who was convinced that he had left a single linen collar on a train and that it must have been turned in to the lost and found department. He wrote four letters about it, covering a period of a month. Heroic attempts were made to locate the collar, but they failed.

This man spent eight cents for postage. The stationery—figure it two cents more. His time—the time of a man who would so employ it can well be figured as worth nothing.

The price of an ordinary linen collar is fifteen cents. Charge the balance of a nickel to profit and loss.

To match the up-State man, there is the instance of a commuting woman who called at the office to learn if a cake of laundry soap, which she had left on a train, had been turned in. It had not.

Sometimes twenty or thirty umbrellas are turned in to the department in a day. A half-dozen are sometimes collected from a single train.

Here is where an old newspaper joke receives the stiletto. Any number of umbrellas are turned in by both trainmen and passengers. And as for rubbers, their name is legion.

Cranks are few. There are few sour faces among the commuters. This seems favorably to advertise commuting. Many appreciable letters are received for services rendered.

Some Pullman Wrinkles.

In the Pullman office in the terminal is located the lost and found department of the sleeping-cars. It is kept as busy as that of the commuters.

Within the past few months, under the regime of Superintendent F. E. Cook, employees in the service have been required

to use more care in searching for lost articles, and not a day passes without generous "rolls" or articles of value being turned in.

There is now a system of bulletining the names of employees who render signal service in this respect. This bulletin-book contains such entries, under recent dates, as the following:

> On Train ——, Car ——, on (date), Conductor —— found roll of bills amounting to $299 belonging to ——, of ——, thereby relieving him of great mental anguish. Owner identified his money, and it was returned to him.

Another entry tells how a porter found jewelry worth four thousand dollars, and turned it over to the conductor, who brought it to New York, where it was quietly claimed and recovered by the owner without newspaper fanfare. Another conductor picked up five hundred dollars' worth of jewels and turned them in, they being claimed the following day.

A pretty good advertisement for employees' honesty, this bulletin-book!

Sometimes much effort is expended on false clues. Upon one occasion the Pullman Company searched far and long for a necklace worth thousands of dollars. The loser was sure it had been left in a car. It was finally found in a waste-basket in the hotel room previously occupied by the woman in a Western city.

Never Missed Her Jewels.

The loss of a plump roll is sometimes reported, but gems predominate in the reports of losses on sleepers. Some time ago a prominent singer left nine hundred dollars worth of diamonds on a Pullman sleeper She was on her way to Canada.

A porter found the gems, and turned them over to the conductor. To show the carelessness of the artistic temperament, the singer stated afterward that she was blissfully unconscious of the disappearance of the gems till advised by the Pullman Company, which learned of the identity of the

THE "LOST AND FOUND" ROOM OF THE PENNSYLVANIA STATION IN NEW YORK LOOKS LIKE THE STOCK-ROOM OF A DEPARTMENT-STORE. EVERYTHING FROM STRAW HATS TO CRUTCHES MAY BE FOUND HERE

owner through some engraving on the jewels.

A family once wildly set the wheels of investigation revolving concerning a small black bag, containing thousands of dollars' worth of jewelry. They were certain it had been left in some sleeper between San Francisco and Manhattan.

The bag was finally located in the cloak-room of the Palace Hotel in Frisco. The family had come away without it, and never remarked its absence until they reached New York.

Meanwhile the hotel people had found it in their suite, and as they had left no forwarding address, had placed it in the cloak-room to await a call

The gamut of inquiries for missing articles, addressed to the Pullman lost and found department, is wide. From the sublime, as evidenced in gems, it descends to the ridiculous.

Even Tooth-Brushes Are Inquired For.

For the files show several letters, sent from time to time, asking for the return of tooth-brushes, and omitting to give any marks of identification.

It has been a rather wide-spread custom to hold Pullman employees responsible for lost valuables and money not subsequently recovered, so far as public opinion is concerned. But a man at present holding a position of trust in the Pullman office in New York has a different story to tell. He was for many years a Pullman conductor, and he used his eyes.

"Take it from me," says he, "in many cases where a passenger loses money or valuables, not later turned in by some employee of the company, you can safely blame another passenger. While I do not claim at all that every Pullman employee who ever rode in a car was or is a George Washington, the odium of suspicion has often been cast upon an innocent employee, when the real culprit, of honorable and prosperous appearance, has gone scot free, and with the goods.

"All kinds of people ride in Pullmans, because all kinds of people have the money to pay for that privilege. Some of them are not particular how they add to their store. You're as liable to have a cleptomaniac for a neighbor in a Pullman as in a department-store.

"In my years on the road I always claimed that many losses charged against Pullman employees were really attributable to passengers. My observation proved this, the thefts ranging from the petty to the serious.

"I have often seen a passenger, ready to alight, cautiously pick up a book some other passenger had left in a seat. Sometimes the owner would detect the action, and exclaim:

"'Pardon me, that's my book.'

"In which case the other would reply, without visible embarrassment:

"'Oh, I thought you had thrown it away.'

"And I have seen similar appropriation, successful or otherwise, of overcoats, wraps, and bags.

"Believe me, the Pullman employee in this matter of suspicion has been rendered by public opinion an Atlas, carrying a lot more than his share upon his shoulders."

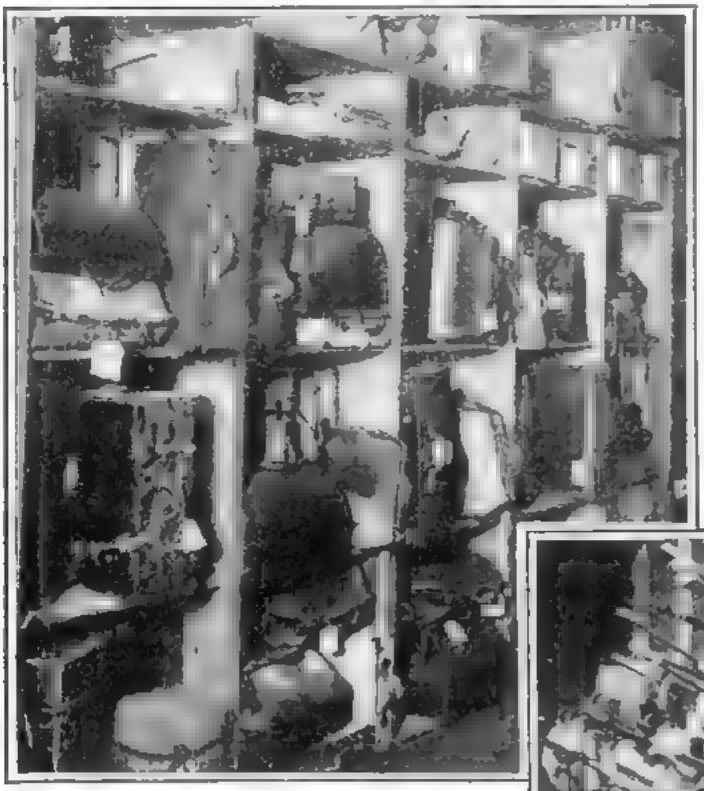
Like the New York Central, the lost and found department of the Pennsylvania terminal in Manhattan is under the supervision of the stationmaster. But there is no separate office for its conduct. It is located in the parcel-stand on the concourse, the employees attending to both lines of endeavor.

Travelers as Forgetful as Commuters.

Most of the articles of divers kinds turned in here are recovered from the Philadelphia trains running into New York, and "the play of the fine-tooth comb" lies mainly in the space between these two points. The department does a rushing business, as real travelers seem fully as forgetful as commuters.

The Pennsylvania gives this branch of its service the utmost attention. If an article of more than ordinary value is turned into the parcel-room the company advertises it in the lost and found columns of New York newspapers.

Many advertisements of jewelry found have been run by the road, and in most instances the advertisements lead to the



AT THE CENTRAL'S NEW YORK CITY TERMINAL A HUNDRED LOST ARTICLES ARE TURNED IN EVERY DAY, AND MANY OF THEM BY PASSENGERS, WHICH CONVINCES RAILROAD PEOPLE THAT THE WORLD REALLY IS FULL OF HONEST FOLK

quick claiming and identification of the gems. The happy owner is thereafter a rooter for the Pennsylvania system, and this little publicity custom is one of the road's best assets of good-will

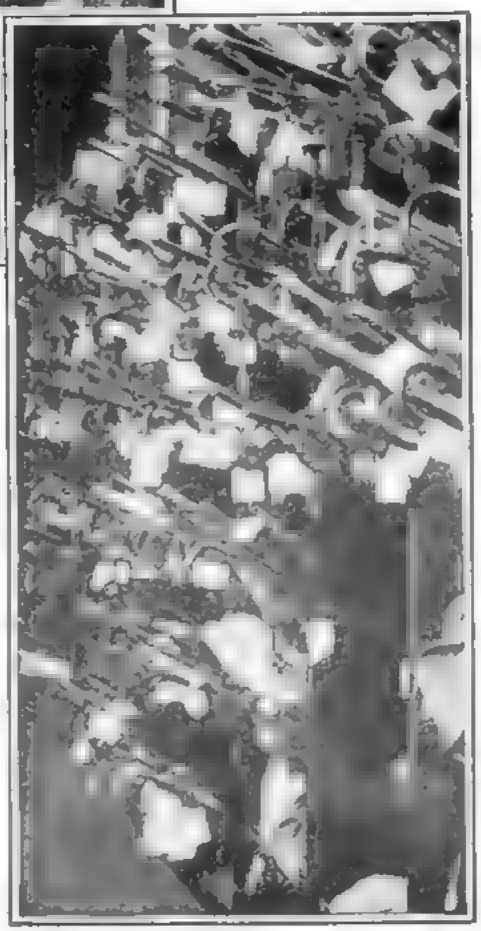
It is also the policy of the Pennsylvania if a piece of baggage or a bundle is found containing an address, to get in touch with the owner at once and not wait for him to call to claim his property

This was recently done in the case of a man who had left some newspaper clippings in a train. A trainman picked them up noticed the owner's address on them, and called the clerk's attention to this when he turned them in.

While the owner was tearing his hair over their loss he was advised that the Pennsylvania was holding them against his call

Connected with the stationmaster's office, which exercises supervision over the lost and found department, is a young man who has earned a unique reputation as a regular *Sherlock Holmes* when it comes to tracing lost baggage

The stationmaster's office is an enduring magnet for the visits of travelers in doubt about anything or everything, and any railroad man will tell you that there are many such. So if a



THERE ARE 7,412 WHEEZES ABOUT LOST UMBRELLAS EVERY ONE OF THEM IS JUSTIFIED FOR PROOF, WE SUBMIT AN ACTUAL PHOTOGRAPH OF ONE SECTION OF A RAILWAY STATION'S "LOST PROPERTY" ROOM

traveler has lost a package or piece of baggage, and is convinced he lost it on the train, he is more likely to visit the station-master's office than the parcel-stand.

Tracing lost baggage is to this young man a hobby. So when the traveler appears with his tale of wo, he is not referred to the regular lost and found department in the parcel-room.

The employee resolves himself into an investigating committee, and quizzes the traveler to a fare-you-well. He usually finds the visitor's memory deficient except on one point. The passenger is sure he left the bag or article somewhere.

The Pennsylvania expert wants to know where. He prods the visitor's memory till he gets a clue.

He follows that clue like a trained police-dog. He invokes the telephone, frequently the telegraph. Oftentimes his search ends at the hotel lately vacated by the passenger.

And because of the grasp and efficiency of the modern young railroad man, the traveler gets his bag.

THE OLD SWITCH GOAT.

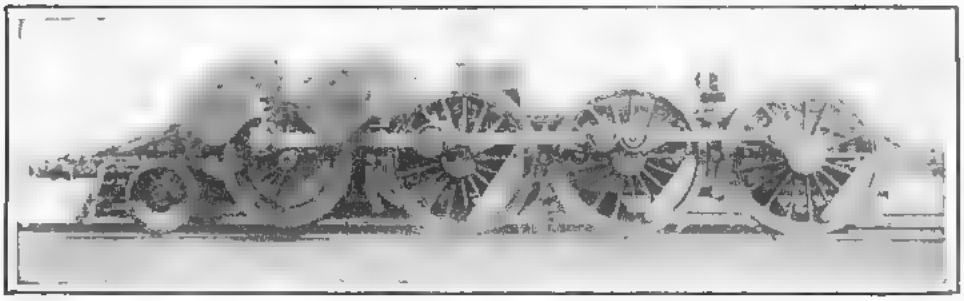
(Being the reverie of an old engine, sold for foreign service.)

BY J. E. CHRISMAN.

NAUGHT did my faithful service count—
Sold for a Frenchman's gold!
Long, weary days, with heart bowed down,
I lay in a freighter's hold.
Dismantled and torn by strangers' hands,
Wrenched by the sea's long roll—
Laugh not, ye sons of a headlong age,
That an engine has no soul!

There was a time, long years ago,
When the railroad world was new;
I was the pride of a hogger's heart,
And pulled the sleepers, too.
Varnished and petted and polished,
My crew and I were pards;
But they pushed me out with the old régime,
To a switch goat's place in the yards.

I'm running now, somewhere in France—
Not much for looks, 'tis true;
But my heart beats high with the news I hear,
Uncle Sam's in the fracas, too!
The great shells crash, the world's aflame;
Some day they'll score a hit—
But just tell the boys on the "Hook and Eye,"
That the old goat did her bit!



NEW HOGS HAVE 2 TRUCKS, EACH WITH 6 DRIVERS, AND 2 MOTORS. THE MOTORS DRIVE A GEAR AT EACH SIDE OF THE TRUCK, AND THESE ARE CONNECTED TO DRIVERS BY SIDE RODS.

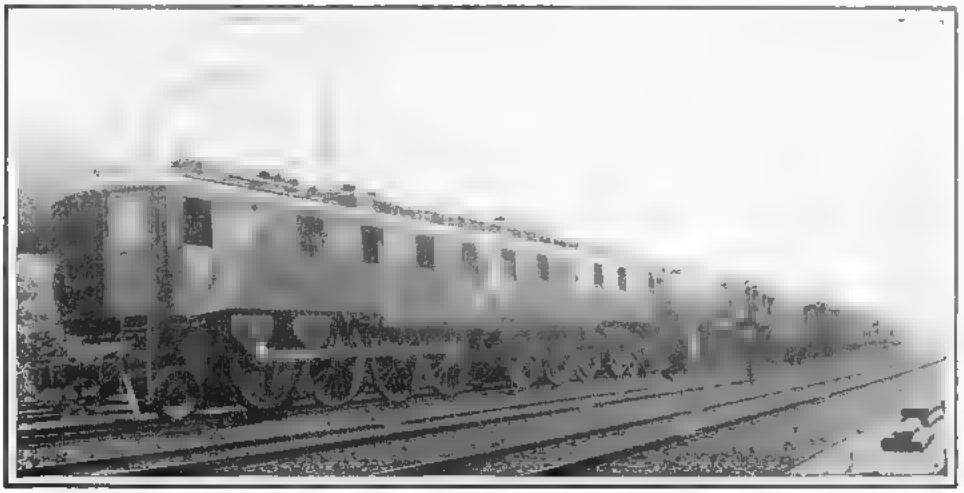
THESE HOGS ARE CAPACITY CHAMPIONS.

Pennsy Solves Congestion Problem by Employing Electric Locomotives with Speed of 21 Miles—No More Slow Drags Over the Alleghanies.

BY WILLIAM H. EASTON.

THE next time you are on the electrified division of the main line of the Pennsylvania Railroad between Philadelphia and Paoli, keep your eyes open for 3931, the latest thing in locomotives. You can hardly miss seeing it should it pass you, for nothing like it ever ran on rails before.

A monster of steel, 76 feet long, with twelve 6-foot driving-wheels and four side rods, which in action irresistibly suggest ungainly limbs — it ambles along like some huge antediluvian dinosaur. Its great bulk indicates immense power, for it is capable of developing 7,000 horse-power, and has a much greater capacity than any other locomotive ever built.



GIANT ELECTRIC LOCOMOTIVE "3931," PUTTING ITS 7,000 HORSE POWER TO USE IN PULLING A 64-CAR FREIGHT TRAIN AND A DEAD STEAM-ENGINE. THIS NEW MONSTER OF THE RAILS IS EXPECTED TO DO WONDERS IN THE ELIMINATION OF FREIGHT CONGESTION.

Strange as its appearance is to-day, in time locomotives of this type will be familiar sights on the division between Altoona and Johnstown, for 3931 is the first of a number of similar locomotives, to be known as type FF1, which will be put in service when this division is electrified.

Electrification of this division is being contemplated because freight congestion is threatening here. Between Altoona and Johnstown the railroad crosses the Alleghany Mountains

Roll 'Em!

There are heavy grades up to the summit in both directions, a long tunnel at Gallitzin, and numerous curves, including the famous Horseshoe Curve. At present three of the largest steam locomotives labor up the grades with the long trains at a snail's pace; but when the division is electrified, two of the new electrics will rush trains weighing 6,400 tons up the grades at 21 miles an hour, thus doubling or tripling the capacity of the present tracks, and eliminating all danger of congestion for many years to come.

The mechanical parts of 3931 were built at the Juniata shops of the Pennsylvania Railroad, and the electrical equipment was supplied by the Westinghouse Electric and Manufacturing Company. There are two trucks, each with six drivers and two motors. The motors drive a gear at each side of the truck, and the gears are connected to the drivers by side rods.

Springs Prevent Excessive Strains.

The connection between the motors and the drivers is, however, not rigid, for a set of springs is provided on each gear, which act as a cushion and prevent the formation of excessive stresses when the motors are started.

These springs do not give, however, except for tractive efforts greater than 25 per cent of the weight on the drivers, so that under all ordinary circumstances the effect of solid gears is obtained.

The side-framing of the cab is of the same type as that of the standard Pennsylvania passenger car, with U-shaped posts bent at the top to support the lower roof deck and sheathed with one-eighth-inch plate. A lined and insulated compartment for the motorman is provided at each end.

High-voltage single-phase alternating current, the form in which electricity can be most economically transmitted over long distances, will be supplied to the locomotive through a trolley wire. On the locomotive, the voltage is reduced to a moderate value by transformers, and then the single-phase current is changed into three-phase current by means of a phase-converter.

This is the same system that is in use on the electrified division of the Norfolk and Western Railroad, and it is employed because three-phase motors are more rugged than single-phase motors, and have better speed and power characteristics for heavy freight service. In this manner the best features of the two electric systems are combined.

She's a Smooth Starter.

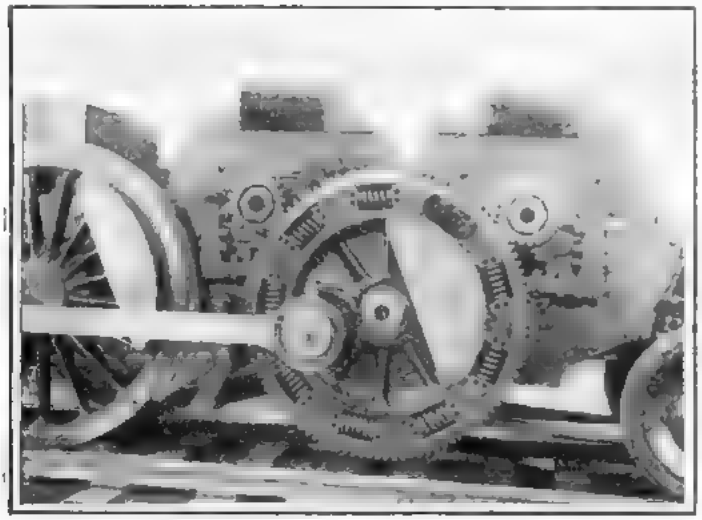
The control is so designed that the locomotive with full load can be started smoothly and easily, without jerks or wheel slippage, and brought up to full speed in a little over two minutes. Though a large number of accelerating steps between the off position and full speed are provided, there are only two running speeds, one of 10 miles an hour and the other of 21 miles an hour

On going down-grade, regenerative braking is employed. In this process the locomotive motors are so connected that they become dynamos, propelled by the weight of the train and generating electric current which returns to the line.

Under these conditions the locomotive can resist the motion of the train with

---

Passing reference to these great engines was made in last month's department, "By the Light of the Lantern." Since then this article was prepared at our request by Mr. Easton, who is connected with the Westinghouse Electric and Manufacturing Company, the creators of these giants. In the interest of completeness Mr. Easton incorporated some of the information which appeared in the previous issue, but he has added thereto so much new material that it would be unfair to turn him in on a lap-order charge.—EDITOR.



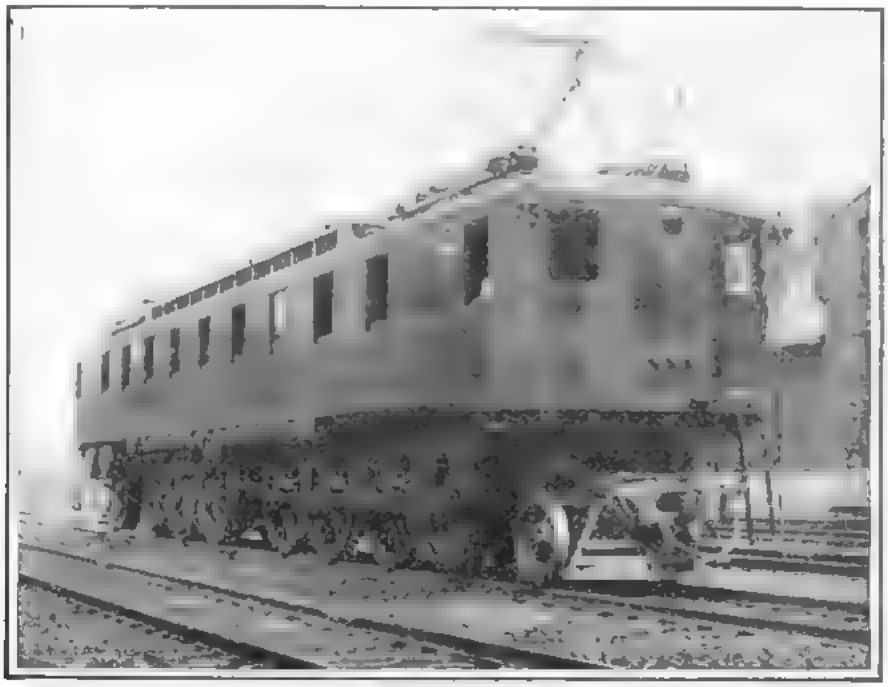
A SET OF SPRINGS, PROVIDED ON EACH GEAR, ACTS AS A CUSHION AND PREVENTS THE FORMATION OF EXCESS STRESSES WHEN THE MOTORS ARE STARTED. THEY ONLY GIVE FOR TRACTIVE EFFORTS GREATER THAN 25 PER CENT OF THE WEIGHT ON THE DRIVERS.

nearly as much power as it can develop when taking current from the line. The amount of resistance it offers can also be varied by means of the controller, just as its speed is varied when running under power.

In consequence the train can come down-grade under perfect control without the use of air-brakes, which are needed only for making full stops and for emergencies. This adds greatly to the safety and ease of operation, saves a great deal of wear and tear on brake-shoes and wheels, and permits of higher average speeds down-grade.

Now on the Paoli Run.

The 3931 is at present in temporary service on the Philadelphia-Paoli line. Later it will be transferred to the Norfolk and Western Railroad, where it will meet with conditions of grade and service similar to



BUILT ESPECIALLY FOR THE PENNSYLVANIA RAILROAD BY THE WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY. "3931" IS 76 FEET LONG AND HAS 12 SIX-FOOT DRIVING WHEELS AND 4 SIDE-RODS. THIS TYPE HAS A GREATER CAPACITY THAN ANY OTHER EVER BUILT.

those found on the division where it will ultimately be used. Here it will be given a thorough service test.

Of course, the 160,000-pound tractive force of the Triplex type steam locomotives on the Erie and Virginian Railroads make these engines the most powerful hogs in the world, for the tractive force of the 3931 is but 87,200 pounds. But the Triplex type is adapted only to slow drags, while the higher speed possibilities in the new electric make its freight-moving capacity much higher, when one figures in terms of total tonnage hauled in a given time, rather than the weight of a single consist.

Some of its principal characteristics are as follows:

	Ft.	In.
Over-all length	76	6¼
Total wheel base	63	11
Driving-wheel base	38	8
Rigid-wheel base	13	4
Height from rail to top of cab	14	8
Over all width	10	1
Weight on drivers	198	tons
Total weight	240	"

WITH THE THROTTLE WIDE OPEN.

Railroads Are Doing a Bigger Business and Paying Higher Wages Than Ever Before.

Southern Railway has increased the pay of all its clerks from 10 to 12 per cent.

United States government recently ordered for service in France 300 80-ton Consolidation locomotives

The government has made an additional provision of $4,000,000 for the construction of the Alaska Railroad

A loan of $386,000,000 at 4½ per cent has been floated in Russia, the money to be used for 17 railway companies

Average number of all-rail coal-cars handled by the New Haven per month this year is 13,213, compared with 12,377 last year

Exports from the United States to the neutral world have doubled since the beginning of the war, and to the belligerent world have trebled

From July 1, 1907, to July 1, 1916, investment of money in physical property of all American railroads increased about $5,000,000, or approximately 39 per cent.

Increased wages and improved working conditions were granted recently by the Canadian Pacific Railway to enginemen, firemen and hostlers on all its Western lines.

The Deficiency Appropriation Bill, passed by the House and Senate, provided for an appropriation of $413,567,777 for the transportation of the army and its supplies.

More than $30,000,000 has already been spent in linking the railways of South America. The project is being carried on by the Antofagasta (Chile) and Bolivia and the Bolivia railways.

Concrete arch extensions on both ends of the Galveston (Texas) causeway have been started by the Gulf, Colorado and Santa Fe and the Southern Pacific. The improvement will cost $1,725,000.

The Russian government has placed orders for an additional 10,000 1,200-*pood* (43,200-lb.) capacity four-wheel box cars. This is the second lot of 10,000 cars on this order on which 40,000 have been authorized.

Atchison, Topeka and Santa Fe has announced an increase in wages ranging from 11 to 15 per cent to car and locomotive employees. This is in addition to the 10 per cent bonus to be paid at the end of December.

The North Georgia Mineral Railroad, presumably a subsidiary of the Louisville and Nashville, has been chartered with a capital of $1,250,000, in contemplation of building a line 50 miles long from Atlanta to a point near Cartersville.

The Sunny Side of the Track

OPERATOR: "Don't you want to sign this telegram?"

Mrs. Hayseed: "'Tain't necessary. Hiram knows my handwritin'."

—*Telegraph and Telephone Review.*

A YOUNG lady telephone operator recently attended a watch-night service and fell asleep during the sermon. At the close the preacher said:

"We will now sing hymn number three-forty-one—three-forty one."

The young lady, just waking in time to hear the number, yawned and said:

"The line is busy."

—*Phillipsburg News Despatch.*

THE following appeared as an advertisement in the Adams, Georgia, *Enterprise:*

"The next cow of mine that's killed by a train won't die alone. I've just bought a new shotgun."

—*Exchange.*

WORRIED Suburbanite: "Have I missed the last train for Stamford to-night?"

Guard: "You have not."

Worried Suburbanite: "I feared as much! I'll have to try again!"—*Judge*

A STOUT, baggage laden old English gentleman was trying to make a hurried exit from a railway carriage. At the door he stumbled on the foot of a brawny Scot.

"Hoots, toots, mon!" groaned the Highlander. "Canna ye look whaur ye're going? Hoot, mon, hoot!"

The burdened traveler slammed the door behind him and shouted through the window:

"Hoot yourself! I am a traveler, not an automobile.—*Argonaut.*

"WILL you stop begging and go home if I give you your carfare?"

"I certainly will, mum."

"Where do you live?"

"In New Orleans."—*New York Times.*

CONDUCTOR: "What's the number of your berth?"

Uncle Hiram: "Waal, let's see—it's July 10, 1845."—*Puck.*

HENNESSY: "Phwat are yez doin' these days, Haggerty?"

Haggerty: "Sure an' I'm a conductor on a hand-car in Clancy's gang."

Hennessy: "A conductor is it ye are? Well, well, well, and phwat do yez have to do?"

Haggerty: "Nuttin' at all but sit still and let the other guys pump the car over the road."

—*Express Gazette.*

MRS. CRAWFORD: "Haven't you ever discovered a way to get money out of your husband?"

Mrs. Crabshaw: "Oh, yes. All I have to do is to threaten to go home to mother, and without a word he hands over the railway fare."

—*The Lamb.*

PATRICK, lately over, was working in the yards of a railroad. One day he happened to be in the yard office when the force was out. The telephone rang for some time before Pat came to the conclusion that it ought to be answered. He approached the instrument cautiously, and slowly put the transmitter to his mouth, as he had seen the "boss" often do.

"Hillo, there," he called.

"Hello," answered some one at the other end, "is this eight-six-ought-four-eight?"

"Aw, g'wan! Phwat d'ye think Oi am, a box-car?" replied Pat.—*Frisco Man.*

A HUNGRY traveler put his head out of a car window as his train pulled up at a small station and said to a boy:

"Here, boy, take this dime and get me a sandwich, will you? And, by the way, here's another dime. Get a sandwich for yourself, too."

"Thanks, boss"—and the boy darted away.

He returned munching a big, fine sandwich, just as the train was starting off. He ran to the traveler, handed him a dime, and said:

"Here's yer dime back, boss. They only had one sandwich left."—*Washington Star*

"YOU understand your duties thoroughly, don't you?" said the stationmaster to the new train-caller.

"Yes, sir; certainly, sir."

"And you know your way to announce?"

"Well, sir, I wouldn't go so far as to say that, but I know my weight to a pound or so."

—*The Scenic Lines' Employees' Magazine*

"I MISSED my regular exercise this morning."

"How was that?"

"The seven thirty-five was late, and I didn't have to run for it."—*Tit-Bits.*

On the Editorial Carpet

Where We Gather in the Hut, Tell Our Troubles, Help One Another, and Sing Some Old Songs.

WHAT'S a railroad without rails? About what a doughnut would be without the ring. Obviously, the story of how rails are made is of some considerable importance to the men who must spend their lives riding over them, and trusting those same lives to their strength. This was a story that had to be covered, and had to be covered right. That's why we put the best all-round railroad writer we know about—the man who has written more good copy about more phases of railroading than any other popular author in our midst—on to the job of visiting the biggest and best mills in the country, and spreading himself on a description of how rails are made. Be sure to read in next month's magazine

THE MAKING OF THE RAIL.

BY CHARLES FREDERICK CARTER,

Author of "When Railroads Were New."

AND when you lay this almost epic narrative down, you will agree with us that the article was worthy of Carter as well as that Carter was worthy of the subject he so splendidly handles.

There are lots of fascinating facts about rails when you get to know them. For instance, there is the fact that of the few simple raw materials which enter into the composition of these twin metallic strips, seemingly so hard and solid, more than half—56 per cent, to be exact—is that intangible, nimble thing, air!

But that surprise is only a starter. It isn't fair to Carter or you to crab the article by putting you on to any more. Go to the news-stand next month with ten cents tight-clutched in your dimpled fist, and make the best trade you ever could make when it comes to swapping money for reading matter. Then turn to Carter's article, and—m'm'm'm'! yum-*yum!*

OF course Carter's article on the making of steel rails is not the only good thing in the next issue. Those technically inclined will obtain both pleasure and good, hard facts from H. A. Kenney's contribution on superheaters, that extraordinary invention, now on some 35,000 American locomotives, which raises the engine's capacity 20 to 30 per cent, while at the same time clipping as much as 30 per cent off the fuel and water bills. You'll find Mr. Kenney's article in the department, "Help for Men Who Help Themselves."

THE next article in the series on "Big Railroading" takes up the subjects of discipline as it is enforced on the New York Central, and the work of that system's police force. Lots of anecdotes, laughs, and thrills. About the time for instance, when one of the Hatfield feudists got fired off the force and started to shoot up Chief Humphrey. Oh, me, oh, my, that was some episode!

SPEED is attracting quite a good deal of discussion among our readers, judging from the number of correspondents writing to us about the matter. So we asked C. H. Claudy to prepare us an article on fast trains and runs, with the result that in the next issue you'll get a sprightly, enlightening article telling you about it. Later, there will be another article— But more of that anon

REMSEN CRAWFORD was in the office the other day, all steamed up over the news that every Cincinnatian is a railroad owner. We knew a fellow from Cincinnati once who didn't have any warts on his thumbs from clipping coupons, so, "Explain, Remsen; explain!" cried we. He did, at length. We'll pass the explanation along to you next month.

ALL these in the January issue, plus a big tonnage of fiction, pictures, departments, jokes, verse, stories, and L. C. L. stuff of all sorts relating to railroad and telegraph.

FOUND IN TEN DAYS.

IN the October issue of the RAILROAD MAN'S MAGAZINE we printed, at the request of his family, an inquiry asking for the whereabouts of Joseph Edward Hines.

Ten days later the Hines family received a letter from the missing one, the first word they had had from him in more than three years.

The aged parents of the "lost" man were overjoyed, and are looking forward with eager anticipation to a happy family reunion in the near future.

Mr. L. E. Hines writes to express his appreciation of the RAILROAD MAN'S MAGAZINE, which turned the trick in such amazingly short time, and brought a new joy to the home of a family of readers.

> I want to thank you for the notice you put in your magazine about my brother, J. E. Hines. We have heard from him at Amarillo, Texas.
>
> My father and mother were the proudest old people in the world when they heard from him. It had been three years or more since they had heard from him. Myself and all the family wish to express our gratitude to you for inserting the notice.
>
> L. E. HINES.
>
> Cordele, Georgia.

It is the aim of this magazine to serve all its readers in every way possible. If there is some member of your family that you have lost track of, send your inquiry to us.

But it will be necessary to abide by the rules governing this department, which we have been obliged to lay down to protect our readers' interests.

We reprint these rules again this month:

Readers of the RAILROAD MAN'S MAGAZINE *who make requests to locate missing relatives through these columns must abide by the following:*

All requests must be written in ink and a complete description of the missing persons given, as well as full name and age.

We will not publish these notices unless they are signed by the nearest living relative of the missing person, and we must be assured that every effort has been made to locate him through the various brotherhoods or associations to which he might belong.

The person making the request must also give his or her complete address.

SNATCHED OFF THE MAIL-CRANE.

WHEN we published that article on "Oprs' Wonderful, Weird Words," in the October issue, we thought that we had covered the ground pretty well. But judging from the letters that have been coming in, making additions to our list, we begin to realize that we only touched the fringe of the brass-pounder's lingo.

If the letters keep on we'll have to get up an encyclopedia or a dictionary, maybe, devoted exclusively to the language of our telegraphic friends.

An interesting feature of this correspondence is the varied points of the compass from which the missives are coming. Each section seems to have at least a few bits of slang in local use and distinctive of that part of the country.

Unfortunately, our space is limited, so we can print only a few of these epistles. Here are three specimens emanating from the South, the middle West, and the far West. One of these is a list of newspaper lingo, which we run because we feel that the newspaper and the telegraph are so closely related that it is certain to be of interest to all wire men.

From California comes this contribution from an old-timer:

> Although I have been out of the game some time, your recent article entitled "Oprs' Wonderful, Weird Words" reminds me of some more.
>
> PAPER PONIES.—Wires connecting the main office with the newspaper offices.
>
> PUTTING FIVE ON A LINE.—Denoting commercial work. Derived from practise of writing words in groups of five to facilitate counting. SMITH'S PUTTING FIVE ON A LINE

Now, i. e, Smith is working for the Western Union or Postal Telegraph Company

Bugs.—When a wire works poorly it is Bugs. This saying is said to have originated when, after the failure of the duplexed wire, it was discovered that the failure was due to a cockroach which had fallen into an ink-well, dragged itself across the top of the rheostat, and fallen into one of the plug-holes, its wet body short-circuiting a connection, throwing the wire out of "balance," and thus causing its failure Therefore the wire became Buggy whenever it failed to work properly thereafter

When sending machines were first introduced, operators were prone to use them on the wire before they became expert in handling them. Unsteady sending resulted, causing the wire to work poorly. As a cause of the poorly working wire, the sending machine also became a Bug, a name which clings to this day.

Package or Valentine.—When mistakes are made, all correspondence relating thereto is submitted to the operator making the error, together with a request by his chief for a statement of his remembrance of the occurrence. When handed these papers he Gets a Valentine or Is Handed a Package.

Peter Man.—In long circuits repeaters or automatic resenders are required at different locations, owing to the length of the wire The man whose duty it is to attend to and adjust these instruments is a Peter Man Called to a wire, he may hear something like this:

"New York dropping, all mud, pull him out, and ride it"; meaning that the transmitter of the New York operator is not passing through the repeaters, letters are dropping out, and the wire is working heavy, or sticky. "Ride him" is a request to the repeater man to adjust the instruments properly

Sending a Board.—An expression in the same class as "Putting Five on a Line" An operator is Sending a Board when he is quoting the market for a brokerage company

T—New York is a Roast. I Broke My Arm on it.—A Roast is a wire upon which the traffic is exceptionally heavy. I Broke My Arm on it means that the heavy work caused operators' paralysis, the bane of all telegraphers, causing loss of control of the muscles of the arm and wrist used in sending

I Think He Signs BK—Meaning that a man is a poor operator. BK is the sign used to stop the sender on duplexed or quaded wires before asking him to repeat. Therefore if a man breaks frequently he "ought to sign BK."

Lost His Grip, Broke His Arm, Glass Arm, Broke His Wrist.—Operator's paralysis.

I Burned 'Em Up and Lifted the Lid—Meaning that the operator sent fast, and caused a poor receiver to be replaced by a more competent operator

And many, many others

Old-Timer

Los Angeles, California

Commenting on the same article, another brass-pounder, whose trick is at the Norfolk, Virginia, Navy Yard, writes to add his bit to the collection of telegraphic lingo in common use among operators. How many of these are you familiar with?

Roast.—Circuit over which a large amount of traffic is handled peculiar to itself, necessarily difficult and hazardous, unceasing, and much hard work.

Dope.—Dull operator.

In the Air.—Messages sent by an operator not knowing there is no one at the other end to receive them. This is called "Sent in the Air."

Clear as a Bell.—Wire working perfectly.

Brass Pounder.—Operator.

Lightning Jerker.—Another name for operator

Floater.—Operator who will not stay in one place long.

Hit the Grit.—This is usually applied to an operator who has been discharged and is forced to seek employment elsewhere

Canned.—Discharged.

Marked Off His Numbers.—Quit.

Stopped His Pay.—Discharged

Under the Table.—Operators usually apply this to themselves when they are unable to copy some fast sender, as: "He put me under the table."

Prize Package.—Correspondence relating to an error in telegram referred to operators concerned for statement

Sent as per Copy.—Statement of sending operator when an error has been made

Shoot.—Meaning to go ahead, to start

Fight.—Contention for circuit, argument, fault finding, *et cetera*

Lay Down—Shirking

Rattled.—Confused

Bust.—Meaning to cancel a message after being sent

A. L. Bigler

U. S. Navy Yard,
Norfolk, Virginia

And just by way of making our collection complete, we print this breezy note from an Indianapolis newspaperman, who not only gives us a choice list, but drives his "weird words" home by using them in his letter.

I just glommed a copy of your rag for October, and have given the sheet the double-O, especially R. Leroy Shaffert's dream on "Opts' Wonderful, Weird Words."

It's some spasm, and hits the spot for one copy-grinder on a Hoosier daily. Here's the reason that sleep puts the jass to me: I'm covering State House for one of Indianapolis P.M.'s, and the line of lingo you sit in on around a commonwealth's den is sufficient to make any key-tickler blush with shame

Aside from being up on the Pips, Morse, International, Sem, and wigwag, you're expected to keep the army, railroad, gas, electric, heat, coal, class and commodity tariffs, ma'arm, aggie, beans, bugs, and some hundred other professional lines of slang cooped in your dizzy can all the time

Aside from being improper, it would be fatal, if not almost criminal, not to know every slang phrase in the newspaper game. Just a few words of explanation, and then some samples of what a Capitol trotter for a daily is supposed to know:

GLOMMED.—Purchased or secured.

RAG.—A newspaper, magazine, or publication of practically any nature other than a book.

SHEET.—Ditto.

DOUBLE O. Looked over, read, received, or inspected.

DREAM.—A story or discourse

SPASM.—Ditto.

COPY GRINDER.—Newspaper reporter or rewrite man

DAILY.—A daily newspaper.

SLEEP Same as dream.

JASS.—*Loco*, jinx, kibosh, or deadening-station. Jass is a general slang phrase which may be used to mean almost anything.

COVERING.—Taking care of, watching, or reporting a certain place or event for a newspaper

P. M.'s.—Afternoon daily newspapers.

LINGO.—Chatter, talk, or language.

SIT-IN ON. To attend, listen to, be present at, or substitute.

COMMONWEALTH'S DEN.—A State House

KEY-TICKLER.—Brass-pounder, D and-D, (dot-and-dash) wrestler, Morse butcher, telegrapher

PIPS.—Abbreviation for Phillips code, telegraphic shorthand

MORSE.—Morse code

INTERNATIONAL.—International or Continental code

SEM Two-armed semaphore signaling-code used in army.

WIGWAG.—Single flag visible army signal-code.

CLASS AND COMMODITY TARIFFS.—Class and commodity railroad freight rates.

MA'ARM.—School-teacher or educational work.

AGGIES.—Agriculturalists or farmers.

BEANS.—All kinds of food.

BUGS.—Bugs, insects, microbes, and germs.

DIZZY CAN.—Head or brain, preferably latter if present in subject.

Now for a few others which you collide with daily "somewhere in a State House":

L. C. L. Less than carload.

C. F. A.—Central Freight Association territory

W. D. O.—War Department order

P.'s AND P.'s.—Petitions and protests, or petitioners and protestants.

K. W. H.—Kilowatt hour

P. S. C.—Public Service Commission.

I. C. C.—Interstate Commerce Commission.

C. O. D. Council of Defense.

S. C. A.—State Conscription Agent.

D. E. B.—District Exemption Board

SX. BD State Board of Accounts.

AT. G. OPS.—Attorney General's opinions.

S. C.—Supreme Court

A. C.—Appellate Court.

LEAD.—The first sentence or paragraph of a newspaper story, or the general skeletonized outline of story.

BREAK EVEN.—Two reporters to protect or keep each other informed as to what is happening on a run, beat, or assignment, to which both are detailed.

PULL A CARBON.—Making carbon copies.

FILLING-IN.—To give a reporter a brief outline of what has happened during his absence

U'D A STORY.—Drop a period, complete, or end a story as soon as possible, usually at once

OVERHEAD.—To send a story to a newspaper office over commercial telephone or telegraph wires.

30.—The end.

"J. E. M." ON THE STAND.

IN two or three instances readers of the magazine have given us a "call" for what would seem to be historical inaccuracies. In one of these we must plead guilty. In the other case we feel that we are justified.

The articles by J. E. M. are not intended as historical narratives, but are merely the reminiscences of an old boomer who has worked on so many railroads that he doesn't recall all their names, to say nothing of dates. It is hardly to be expected, therefore, that, writing from memory as he does, he can be accurate in details. We don't ask him to be, since we presume that what our readers are interested in chiefly in these articles are the anecdotes and word-pictures of railroading in days gone by. Here are the kicks:

As I know most publishers wish to be correct in all articles they print, I will call your attention to a mistake in the one entitled "Old Times on the Denver City." The impression is conveyed that Charles A. Culbertson was Governor of Texas in 1888, when, in fact, Lawrence Sullivan Ross was

Governor of Texas at that time. He, Ross, was followed by James Steven Hogg, who was inaugurated Governor of Texas in January, 1890. Charles A. Culbertson followed Hogg as Governor, and was inaugurated in January, 1894.

Yours, very truly,

JOHN HOWLAND

Oxnard, California

The articles by J. E. M. are interesting chiefly on account of the glaring errors he makes. I don't believe he ever worked on any of the roads he writes about, especially in the old days. In fact, I believe he is a silk-stocking dude that sits up a twenty-story office-building and smokes hop.

He calls the G., H. and S. A. the Galveston, Houston and San Antonio, when everybody who has ever worked on that road knows it is the Galveston, Harrisburg and San Antonio

He speaks of No. 243 or 244 running during George Stewart's time as chief despatcher, whereas the manifest freights in those days were 23 or 24, and, furthermore, the odd numbers then ran last.

There were quite a number of other errors, but I'll pass 'em and go to his article on the E. P. and S W He missed the time of the acquisition of the E. P. and N. E. by about five years. In general he showed a lack of familiarity with that system.

In his article on the Ft W. and D., he ignores the fact that this line was built by Morgan Jones, of Fort Worth before the C. and S. was a road. I think, but I am not sure, that the C and S. was then a branch of the U. P., and was built by General G M Dodge. Mr. Trumbull came in years later

For the love of Heaven, put him in on a spur and take out the switch-points

MIKE MURPHY.

Dallas, Texas.

Here is what "J. E. M." himself has to say about it.

I have carefully perused the criticisms by Mr. Murphy, of Dallas, Texas. I am glad that you turned this over to me, as I am always ready and willing to correct an error Mr. Murphy is correct in saying that the G., H and S. A. is the Galveston, Harrisburg and San Antonio. Why I should have substituted Houston for Harrisburg, I can not explain, as I surely knew better. That, however, is scarcely a "glaring" error

As for being a silk-stocking dude, I must emphatically plead *"Not guilty."* I never had money enough at one time to purchase a pair of silk stockings, and most of the time I am forced to admit that I am a disciple of the famous Kansas statesman, Jerry Simpson

As to the number of the trains running on the G., H and S. A when Mr Stewart was chief despatcher at El Paso, I am sure that so far as the number of the trains are concerned, it makes but little difference; and if you will recall in several or most of my articles I declare that the article is in no way intended as an authentic history of the road, but merely as a set of incidents pieced together, all of which are facts, to make an interesting and readable article.

Regarding the Fort Worth and Denver I did not mention Mr. Morgan Jones as building that road, as his connection with it was of short duration, and ceased when the road had reached Wichita Falls, Texas. The Colorado and Southern was not built by General Grenville M. Dodge, but that portion of it which was for a long time an "orphan," running from Orin Junction, Wyoming, to Cheyenne, was built by that gentleman, and for a time was the property of the Union Pacific Some time about 1898, or perhaps a year or two later, the whole Colorado Southern and Fort Worth and Denver systems were under the control of the Union Pacific, and operated by them for a time under the name of the Union Pacific, Denver and Gulf Railroad.

In reference to the El Paso and Southwestern system, probably, as I have stated, the mention of the year when they obtained control of the El Paso and Northeastern was wrong; but the matter of the years, as stated above, are not to be taken as exact historical data I know what I am writing about, but my "whens" aren't as clear in my mind as my "whats" are.

Anyway, I am pleased to know that Mr. Murphy takes so much interest in the RAILROAD MAN'S MAGAZINE as to "call me down" in any little errors that I may make

I can readily mitt Mr. Murphy, as he hails from Dallas; I called that my home on one or two occasions. Come again, Mr. Murphy. I'll be glad to hear from you. "J. E. M."

But we have no disclaimer to present on behalf of Theodore Benton, who wrote "Evolution of R R. Rules," in the June number, which contained a large amount of historical data pertaining to the Erie Railroad. We assumed that he had his facts straight, since his previous articles had always proved satisfactory to our readers. However, a writer signing himself "More Anon" pointed out a number of misstatements, so we called Mr. Benton on to the carpet.

He told us that he had got his information from conversations with old-time Erie employees, but admitted he had not taken the trouble to check up his facts and figures.

We could not excuse him on this account, and so in the future the RAILROAD MAN'S MAGAZINE will contain no more articles by Theodore Benton.

SONGS BY BARDS OF RAIL AND WIRE.

THE DREAMER.

MIGHT of the roaring boiler,
Force of the engine's thrust,
Strength of the sweating toiler,
Greatly in these we trust.
But back of them stands the Schemer,
The Thinker who drives things through;
Back of the job—the Dreamer,
Who's making the dream come true!

—BERTON BRALEY.

THE OLD LOCOMOTIVE.

PATIENT and dumb, on the back-shop track,
The old locomotive stands,
There are ribbons of rust along the stack,
The jacket molds at the bands.
It waits in vain for the call-boy's cry
As he hurriedly seeks the men,
And it longs o'er the glistening steel to fly,
And to lead the charge again.

Time was when the old engine was new
And shone with a silvery sheen,
Pulling full tonnage the long years through—
No better service e'er seen
Then 'twas hailed as the pride and joy of the rail
In the days of links and pins—
Climbing over the steel-shod trail
Far out where the West begins.

Patient and dumb on the back-shop spur
The old locomotive stands,
Awaiting the throb of steam to stir—
The touch of its master's hands.
Alas and alack! Its life work is done,
Which causes us many a sigh,
The old locomotive has made its last run,
Then good-by, old scout—good-by!

—JAMES DEEGAN.

Elko, Nevada.

LIFE'S RAILWAY TO HEAVEN.

We are indebted to Mrs. Annie Chilson, 402 So th Avenue, Hot Springs, Arkansas, for a transcript of this poem, for which we recently published an appeal.

LIFE is like a mountain railway,
With an engineer that's brave;
We must make the run successful
From the cradle to the grave.
Watch the curves, the fills, the tunnels,
Never falter, never fail;
Keep your hand upon the throttle,
And your eye upon the rail.

CHORUS:
Blessed Savior, Thou wilt guide me
Till we reach the blessed shore,
Where the angels wait to join us
In Thy praise for evermore.

You will roll up grades of trial,
You will cross the bridge of strife;
See that Christ is your conductor
On this lightning train of life
Always mindful of obstructions,
Do your duty, never fail;
Keep your hand upon the throttle,
And your eye upon the rail

(CHORUS)

You will often find obstructions;
Look for storms of wind and rain;
On a fill, or curve, or threstle,
They will almost ditch your train.
Put your trust alone in Jesus,
Never falter, never fail;
Keep your hand upon the throttle,
And your eye upon the rail.

(CHORUS)

As you roll across the trestle
Spanning death's dark, swelling tide;
You behold the Union Depot
Into which your train will glide
There you'll meet the Superintendent,
God the Father, God the Son,
With the hearty, joyous plaudits:
"Weary pilgrim, welcome home."

(CHORUS)

—CHARLEY D TILLMAN.

CODE OF THE CARS.

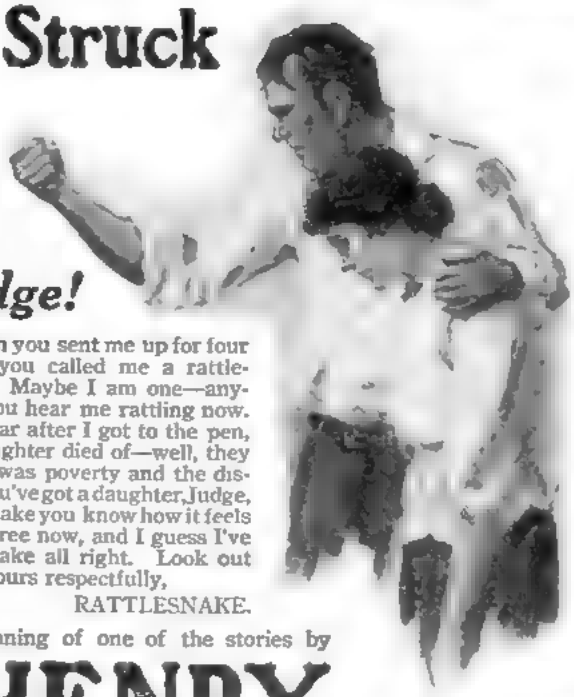
POETS may rave of the stars o'er the wave;
Of the moon as it silvers the sea;
Of the fair countryside in the dim eventide,
But they hold no beauty for me

Put me at night where the yard lights are bright,
And the semaphores gleam through the dark,
Where each shadowy rail is a lantern lit trail
And the oncoming train is a spark.

There let me dream while the dragons of steam
Drive past in the light of the stars,
And the ruby and green of each lantern is seen
As they twinkle the code of the cars.

—*Southern Pacific Bulletin.*

When the Rattlesnake Struck



Judge!

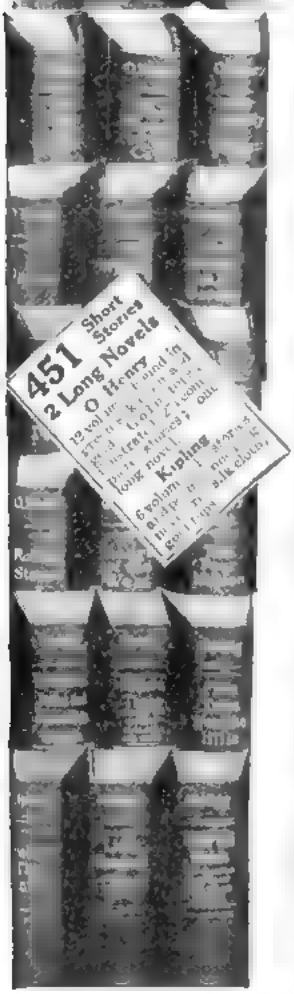
When you sent me up for four years, you called me a rattlesnake. Maybe I am one—anyhow, you hear me rattling now. One year after I got to the pen, my daughter died of—well, they said it was poverty and the disgrace together. You've got a daughter, Judge, and I'm going to make you know how it feels to lose one. I'm free now, and I guess I've turned to rattlesnake all right. Look out when I strike. Yours respectfully,

RATTLESNAKE.

This is the beginning of one of the stories by

O. HENRY

Send Coupon for the 12 Volumes, 274 Stories



Up—up—up goes the sale of O. Henry, higher and higher every day. Long ago he reached high above all records in the world for the sale of short stories. And still the sales climb until soon there will be no home without O. Henry. 1,600,000 already in the United States! How many thousands in Australia, France, England, Germany, Africa and Asia we cannot tell. And all because O. Henry is among the few very greatest in all literature—greatest in humor, human sympathy, in pity and understanding. The man on the street loves him; the university professor pays him homage. The sale of O Henry will go on forever, for his is a quality that is undying. But the sale at this low price must soon be over. So now, while you can, get your set. You must have O. Henry if your library is to be complete. You must have O. Henry if you are to get out of life the beauty and fun it holds. You can have his work at half price if you send the coupon today; you can have, besides

KIPLING 6 Volumes 179 Stories FREE

Before the war started Kipling easily held place as the first of living writers. Now we know him to be greater than ever. For in his pages is the very spirit of war. Not only the spirit of English war, but the spirit of all war regardless of nation or flag—the lust of fight, the grimness of death, and the beating heart of courage. "Tommy Atkins" is dying today in the trenches. The Taking of Lungtungpen, where the British soldiers [illegible] was never born gives a hint of what they may do today with a few clothes on, and "Gunga Din" recalls the deathless heroism of plain men in battle.

Send Coupon Without Money

and the two sets of books, 18 volumes, will go to you promptly, all charges prepaid. If they are not the best you ever read, if you do not read them and reread them, send them back at our expense. If you are not proud to have them on your library shelves, send them back. But send coupon today. It puts you under no obligation. It gives you no trouble. Send it today before offer closes.

Review of Reviews Co., 30 Irving Place, N.Y.

REVIEW of REVIEWS COMPANY
30 Irving Pl., N.Y.

Name .....

Address .....

Occupation .....

Chesterfield

CIGARETTES

of Imported and Domestic tobaccos—Blended

The *new* blend—and it can't be copied

The *new blend* of Imported and Domestic tobaccos in this *new* cigarette, Chesterfield, does a *new* and important thing for smokers—

Chesterfields "reach home," they *let you know you are smoking*—they *"Satisfy"*!

Yet, they're Mild!

There *is* more to a cigarette than merely the good taste. Easy to prove it—try Chesterfields Today.

Liggett & Myers Tobacco Co.

SEND HIM THE TIN OF 100. We'll mail the box you like for 65c prepaid to any address in the U. S. (transportation extra). If your dealer has not them. Address Liggett & Myers Tobacco Co., 212 Fifth Ave., New York

10c

They "Satisfy"—and yet they're Mild!

DIAMONDS-WATCHES ON CREDIT

CHOOSE YOUR GIFTS FROM OUR CATALOG

The Above Handsome
Solid Gold La Valliere

No. 925, is our big leader. Four beautiful, perfect cut

Genuine Diamonds

$5 Down **$25** $2.50 a Month

Send for Free Catalog

There are over 2,000 photographic illustrations of Diamond Rings, Diamond La Vallieres, Diamond Ear Screws, Diamond Scarf Pins, Diamond Studs, Signet and Emblem Rings, Watches, Wrist Watches, Bracelets, Cuff Links, Brooches, Lockets, Chains, Charms, Silverware, Clocks, Toilet Sets, also our wonderfully showy assembled Solitaire Diamond Clusters.

Whatever you select will be sent, all charges prepaid. You see and examine the article right in your own hands. If satisfied, pay one-fifth of purchase price and keep it; balance divided into eight equal amounts, payable monthly.

Suggestions for Christmas Presents

A few of the many desirable articles shown in our large handsome Catalog. Every article listed below can be furnished at prices given and up to any price you wish to pay. All are popular selections, of exceptional value. We can fill any requirement.

Diamond Rings, Solitaire	$10 up	Diamond Cuff Links	$5 up
Loftis Solitaire Diamond Cluster Rings	$50 up	Diamond Scarf Pins	$8 up
Diamond La Vallieres	$10 up	Pearl Necklaces, Diamond-set Clasp	$8.50 up
Diamond-set Cameo La Vallieres	$12 up	Wrist Watches	$10 up
Diamond Brooches	$7 up	Watches, gold filled	$12 up
Diamond Ear Screws	$10 up	Bracelets, solid gold	$12 up
Diamond Studs	$10 up	Cameo Rings, Diamond-set	$12 up
		Vest Chains, solid gold	$12 up

Tells All About Our Easy Credit System.

OVER 2000 ILLUSTRATIONS.

Send for Your Copy of This Catalog

21 JEWEL WATCHES That Will Pass Railroad Inspection **$2.50 a Month**

Our Catalog illustrates and describes all the new models—15, 17, 19, 21, 23 Jewel—adjusted. All cases guaranteed 25 years. Choice of popular styles and engravings. Our watches are guaranteed by the factory and further guaranteed by us.

Send for Catalog, make selections, and have as many articles as you wish charged in one account.

Any diamond purchase from us for a present may be exchanged for other selection at full price within one year and we will refund the amount paid for it.

With this privilege you need have no hesitancy in ordering gifts.

LOFTIS BROS & CO. ESTD. 1858

National Credit Jewelers

Dept. C 849 — 108 N. State St., Chicago, Ill.

STORES IN LEADING CITIES

DIAMONDS WATCHES & JEWELRY

Extraordinary Values

in perfect cut Blue-white Diamonds, brilliant—sparkling—full of life and fire. Watches of all standard well known makes and jewelry of guaranteed quality.

We will gladly open charge accounts on easy terms with any reputable person. Terms as low as $1.00 a month. No interest charged or security required.

The Diamond, Watch or any article you select will be sent prepaid to your bank or express subject to examination and approval. If the goods are not satisfactory in every way you may return them at our expense. We take all the risk.

With every Diamond we furnish a Guarantee Certificate attesting its value and providing for exchange at full purchase price.

Our general catalog No 97 will be gladly sent free upon request.

J. M. LYON & CO.

No. 1 Maiden Lane *North East Cor. Broadway,* New York, U.S.A.

Red or Black **"Vulcan" Ink Pencils**

The ONLY perfect non-leakable ink pencils at moderate prices.

Two Sizes 4 1/4 and 5 1/2 ins.

Extra size 8 inches (black or red) $1.25. Your name in gold 10c. FREE Liberal supply of ink with retail orders. Thousands used by telegraphers. *Agents Wanted*

Order today **$1**

J. Z. ULLRICH & CO., 27 Thames St., New York

DEAFNESS IS MISERY

I know because I was Deaf and had Head Noises for over 30 years. My invisible Auricles Ear Drums restore my hearing and stopped Head Noises, and will do it for you. They are my Megaphones. Cannot be seen when worn. Easy to put in, easy to take out. Are "Unseen Comforts." Inexpensive. Write for Booklet and my sworn statement of how I recovered my Hearing.

A. O. LEONARD
Suite 251, 150 5th Ave, N. Y. City

Send for a Complete Catalogue of

MASONIC BOOKS, Jewelry and Goods

REDDING & CO.

Publishers and Manufacturers

Dept. R 200 Fifth Avenue, New York.

Wanted: An Idea

Who can think of some simple thing to patent? Protect your ideas; they may bring you wealth. Write for "Needed Inventions" and lists of Patent Buyers

RANDOLPH & CO., Pat. Attorneys, Dept 138, Washington, D. C.

Do You Keep In Touch

with the daily happenings in this world of ours? The stupendous changes which are constantly taking place demand your closest attention. And reading is the most efficient method of keeping up to date.

EACH MONTH

Munsey's Magazine

CONTAINS 192 PAGES

of *special articles* of national and international importance. *Editorials, a stage* and a *book section,* and a number of *short* and *continued stories, poems* and other interesting features.

Ten cents -:- *On all news-stands*

THERE'S SOMETHING FOR YOU IN EVERY ISSUE

THE FRANK A. MUNSEY COMPANY

8 West Fortieth Street, New York

—at night, particularly, Railroad men need a RADIOLITE

UP on the engine deck—with only the feeble flicker of a torch—you need a day-and-night Radiolite Watch.

In the inky black corners of the yard, Radiolite Watches tell the *right* time as clearly as in daylight.

Every railroader needs a dependable, accurate, rugged, low-priced *radium*-lighted watch.

Even conductors and engineers should carry a Radiolite too.

Real radium makes the Radiolite hands and figures glow—it makes them *glow* the time for you.

Only Ingersolls are *Radiolites*. Get one of the five styles and sizes at your dealer's today.

Robt. H. Ingersoll & Bro.

New York Boston Chicago San Francisco Montreal

Ingersoll

RADIOLITE MODELS
$2 25 to $4 50

Other Models
$1 35 to $6 00

The Florsheim SHOE

FLORSHEIM stands for quality today as in the past—high grade workmanship and solid leather throughout—a shoe that represents full satisfaction for every dollar you invest.

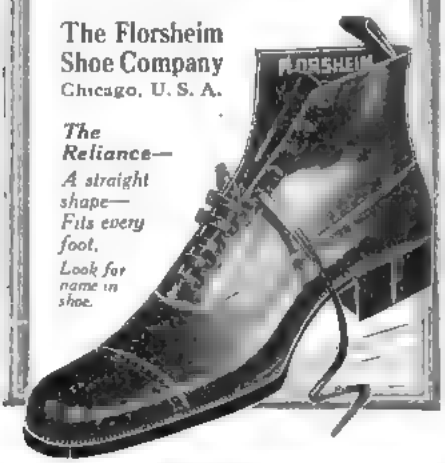
Good shoes help you perform your day's work better—they're comfortable from the start and cost no more in the end.

Eight to Ten Dollars, reasonably priced, value considered.

There's a Florsheim dealer in every city showing the season's correct styles. His name and booklet on request.

The Florsheim Shoe Company
Chicago, U. S. A.

The Reliance—
A straight shape—
Fits every foot.
Look for name in shoe.



R. MORGAN ELLIOTT & CO.
PATENT ATTORNEYS
MECHANICAL ELECTRICAL & CHEMICAL EXPERTS
718-726 WOODWARD BUILDING
WASHINGTON, D. C.

Signal Overalls
Made of TubTesT COPYRIGHTED Fabrics

Are Different Overalls

There Is a Reason

Go to Your Dealer

and ask him to show you a Signal TubTesT non-shrinkable overall. If he does not carry them, send us your size and we will send you a pair on approval.

Hilker-Wiechers Mfg. Co.

Dept. A1252 Mound Ave.
Racine, Wis.

Makers of the Famous Signal TubTesT Shirts

SIGNAL OVERALLS

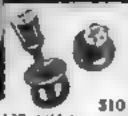
Always look for this trade mark—it's the "Safety First" sign in buying overalls.

GENUINE

DIAMONDS

$70 PER CARAT

FROM THE DIAMOND CUTTERS DIRECT TO YOU BY MAIL AT THE DIAMOND CUTTER'S PRICES



A127 14K Ear screws 2 blue-white diamonds. Per pair ... $10 00

$10 00

A125 $8 95
Solid Gold lavalliere and chain. 3 fine diamonds $8.95

$39.00. A126 14K cluster platinum top. 7 blue white diamonds Complete $39 00

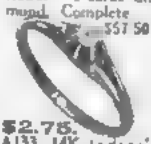
A128 $25 00
14K Mtd. ¼ carat diamond

A129 $16.75
14K ladies' solitaire ¼carat diamond.

$57.50
A130 14K man's solitaire. ½-carat diamond. Complete ... $57 50

$25.00
A131 14K cluster scarf pin. 7 blue-white diamonds. Complete, $25.00

$36.65
A132 14K ladies' solitaire. ¾-carat diamond. Complete ... $36 65



$2.75.
A133 14K ladies' belcher solitaire. 1 diamond. Complete ... $2.75

FREE EXAMINATION—NO OBLIGATION

To convince you beyond the shadow of a doubt that our values are absolutely unequaled, we will gladly forward you any article from this ad or from our Catalog, care of your bank or express office, for your examination and approval. We prepay all charges

YOUR MONEY BACK IN FULL ANY TIME WITHIN ONE YEAR

Our ironclad guarantee gives you the right to *return the diamond* to us *any time within one year* and *we give you back the full price you paid without even one cent being deducted.* This guarantee is *final evidence of the superior values we offer.*

BIG 1918 CATALOG FREE

This new 1918 Catalog is a wonderful guide to the selection of Christmas Gifts and gifts for all other occasions. It contains 244 pages of intensely interesting and valuable information written by recognized experts on Diamonds, Watches, Jewelry, etc., and quotes thousands of money-saving prices. Write us a letter or postcard for this book NOW

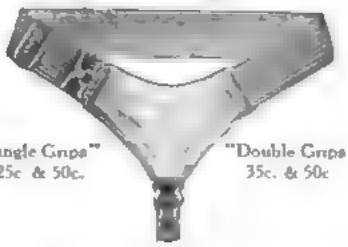
FREE! We will mail you, postpaid, a beautiful Red, White and Blue Enameled Flag Button with our Catalog, free, if you mention this magazine.

I. PRESS & SONS

IMPORTERS AND CUTTERS OF DIAMONDS
WHOLESALE JEWELERS
807 A CHESTNUT ST.
PHILADELPHIA, PA.

Boston Garter

Velvet Grip



"Single Grips" 25c & 50c.

"Double Grips" 35c. & 50c

Highly Nickeled

For your safety, security and comfort, garter fittings of metal are most essential. In the "Boston" these parts are highly nickeled, have smooth, rounded corners and edges and are so protected that they do not come in contact with the skin. You'll like the "feel" of the smoothly finished metal fittings—they are stout, strong and extremely light

GEORGE FROST CO., MAKERS, BOSTON

Your diamond is bonded by

MASS. BONDING CO.

When You Buy It Of Us

We sell diamonds of the finest quality at attractive prices. Buying diamonds direct and [illegible] than large, showy, expensive offices, we offer better values for the same money.

[illegible] MASS. BONDING COMPANY [illegible]

By this Agreement [illegible] MASS. BONDING COMPANY [illegible] YOUR MONEY BACK.

[illegible] suffering THIS DOUBLE-BARRELLED SECURITY.

[illegible] Order Safely by Mail To-day

Ask for Catalog No. 33

FRANK N. NATHAN CO.

373 Washington St., Boston, Mass.

DIAMOND MERCHANTS OVER 27 YEARS

This book Free

Write To-day

Tells how to order [illegible]

Distinctive Gentleman's Ring

[illegible] of 14 Kt. Solid Gold mounting. Diamond set in Solid Platinum

Only $95

Safeguard every cut, scratch or abrasion from the danger of infection by immediately applying

LISTERINE

The Safe Antiseptic

SHINE YOUR OWN SHOES AND SAVE MONEY

IT IS VERY EASY WITH OUR ADJUSTABLE ALL METAL BRACKET

For Men, Women and Children's Shoes

LASTS A LIFE TIME

PAYS FOR ITSELF FIRST MONTH

No Soiled Hands

No Bending

Holds Any Size Shoe

Sent prepaid for $1.50
In Canada the price is $2

F. S. KAY CO.
Dept. R R
1733 Republic Bldg., Chicago

WANTED—More Salesmen —Salesmen Earn

DOUBLE THIS YEAR

Earned $6,500 "Last year I earned $3,500. This year $6,500. I promoted to Sales Manager. All credit to you. You offer your men a MANY Good Positions." C. W. Birmingham Dayton, Ohio

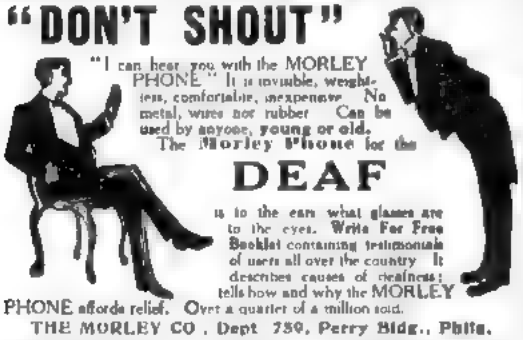
only an ordinary record. Thousands of successful members. Even greater opportunities are yours as a City or Traveling Salesman. Increased prosperity, enlistments and the Draft have created thousands of good positions. Experience unnecessary.

Write for large list of lines in which good positions are open and how to obtain them. Address nearest office Dept. 2-T

NAT'L SALESMEN'S TR. ASS'N
Chicago San Francisco New York

BE A TRAVELING SALESMAN

"DON'T SHOUT"



"I can hear you with the MORLEY PHONE." It is invisible, weightless, comfortable, inexpensive. No metal, wires nor rubber. Can be used by anyone, young or old.

The Morley Phone for the

DEAF

is to the ear what glasses are to the eyes. Write For Free Booklet containing testimonials of users all over the country. It describes causes of deafness; tells how and why the MORLEY PHONE affords relief. Over a quarter of a million sold.

THE MORLEY CO., Dept. 739, Perry Bldg., Phila.

½ PRICE—TO INTRODUCE

Only $2.50

To prove to you that our blue-white MEXICAN DIAMOND exactly resembles the finest genuine South African Gem, with same dazzling, rainbow brilliancy (Guaranteed), we will send you this beautiful, high-grade, 12-kt. gold filled Tiffany ring, set with 1 ct. gem, regular catalog price $4.00, for One Half Price, $2.50. Same gem in Gent's Heavy Tooth, Belcher ring, catalog price, $6.50 for $3.10. Wonderful "darzling" rainbow brilliancy. Guaranteed 20 Years. Send $1.00 and we will ship C. O. D. for Free Examination. Money back if not pleased. Sold this way for a limited time only. One to a customer. Catalog Free. Agents Wanted.

MEXICAN DIAMOND IMPORTING CO., Dept. S. S., Las Cruces, New Mexico
Exclusive Controllers of the Genuine Mexican Diamond

Guaranteed Genuine Leather Pocketbook

The "American Bankroll" Model Combination Billfold, Coin Purse, Card and Photo-case. Finest Genuine Black Sea Grain Leather with [illegible] Dollar Article for only 50c [illegible] Any [illegible] 23 Karat Genuine Gold Free [illegible] deeply [illegible] Mexican [illegible] Folded [illegible] your [illegible] Every [illegible] GUARANTEED LEATHER GOODS and NOVELTIES [illegible]

U. S. LEATHER GOODS COMPANY, Dept. 8-D, 106-8-10 W. Lake St., Chicago
Established 1908 Incorporated 1910

50c
Postpaid

Fits any Pocket

For Ladies and Gentlemen

U.S.L.G.G.Co.

In answering any advertisement on this page it is desirable that you mention RAILROAD MAN'S MAGAZINE

B3

It is difficult to grow old gracefully. —*Old Proverb.*

Yet that is the prayer of all of us—to grow old gracefully. What is more charming than a bright, happy old person?

Is age creeping upon you? Are there old folks in your home? Then you know how peculiarly dependent their minds and spirits are upon robustness of body.

ANHEUSER-BUSCH'S

Malt-Nutrine

Liquid-Food-Tonic

helps old people to say—"I am (?) years young." It has the warm endorsement of the medical profession as a strengthening food-tonic for the old, the convalescent, the overworked and the anæmic. Should be taken at each meal and before retiring.

All Druggists—Most Grocers

Malt-Nutrine declared by U. S. Internal Revenue Department to be a pure malt product—not an alcoholic beverage. Contains 14.50 per cent malt solids—1.9 per cent alcohol.

Interesting booklet on request.

Anheuser-Busch St. Louis, U. S. A.

In answering this advertisement it is desirable that you mention RAILROAD MAN'S MAGAZINE.

6-Piece Set
Fumed Solid Oak

$1.00 A Room Full of Furniture

Send only $1.00, and we will ship you this handsome 6-piece library set. Only $1.00 down, then $2.00 per month, or only $18.90 in all. A positively staggering value, and one of the biggest bargains we have ever offered. Look at this massive set, clip the coupon below and have it shipped on approval. Then see for yourself what a beautiful set it is. If you do not like it, return it in 30 days and we will return your money. All you have to do is send the coupon with $1.00. This magnificent library set is just one of the many extraordinary bargains shown in our giant catalog and bargain list which we will send you free. No obligations. Send today sure. Either have set sent for you to see, or tell us to mail catalog.

6 Pieces This superb six-piece library set is made of selected solid oak throughout, finished in rich dull waxed, brown fumed oak. Large arm rocker and arm chair are 36 inches high, seats 19x 9 inches. Sewing rocker and reception chair are 36 inches high, seats 17x17 inches. All four pieces are luxuriously padded, seats upholstered in brown imitation Spanish leather. Library table has 24x34 in. top, with roomy magazine shelf below, and beautifully designed ends. Jardinere stand measures 47 inches high, with 12 inch top. Clip the coupon below, and send it to us with $1.00, and we will ship the entire set of six pieces, subject to your approval. **No C. O. D.** Sent knocked down. Easy to set up. Shipping weight, about 150 pounds. Money back if you are not pleased. **Order by No. 84349WA. Send $1.00 with order; $2.00 monthly. Price, only $18.90.**

Act Now—While This Special Offer Lasts!

Don't wait a day longer. Sit down today and send in the coupon for this 6-piece Fumed Solid Oak Library Set. For a limited time only are we able to offer you this stupendous bargain. Prices, as you know, on everything are going up, up, up. It is impossible to tell just what day it will be necessary for us to increase the price of this wonderful Fumed Solid Oak Library Set. So act, but act quickly. Fill out the coupon and send it to us with the first small payment and we will ship you this wonderful 6-piece Fumed Solid Oak Library Set. **Pieces not sold separately.**

Send This Coupon

Along with $1.00 to us now. Have this fine library set shipped on 30 days' trial. We will also send our big Bargain Catalog listing thousands of amazing bargains. Only a small first payment and balance in monthly payments for anything you want. Send coupon today.

Free Trial Coupon
STRAUS & SCHRAM, (Inc.)
W. 35th St. Dept. 1379 **—W. 35th St., Chicago, Ill.**

Enclosed find $1.00. Ship special advertised 6 Piece Fumed Oak Library Suite. I am to have 30 days' free trial. If I keep the suite I will pay you $2.00 monthly. If not satisfied I am to return the suite within 30 days and you are to refund my money and any freight charges I paid.

☐ 6-Piece Library Set, No. 84349WA, $18.90

Name .....

Address .....

Post Office ..... State .....

If you only want the Catalog, put X below

☐ Furniture ☐ Stoves ☐ Jewelry ☐ Paints ☐ Roofing
☐ Men's, Women's and Children's Clothing

Easy Payments

Open an account with us. We trust honest people, no matter where you live. Send for this wonderful bargain shown above or choose from our big catalog. One price to all, cash or credit. **No discount for cash.** Not one penny extra for credit. Do not ask for a special cash price. We cannot offer any discount from these sensational prices.

30 Days' Trial

Our guarantee protects you. If not perfectly satisfied, return the article at our expense within 30 days and get your money back—also any freight you paid. Could any offer be fairer?

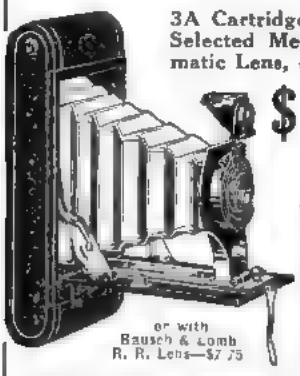
Free Bargain Catalog

Send for it. Shows thousands of bargains in furniture, jewelry, carpets, rugs, curtains, silverware, stoves, women's, men's and children's wearing apparel. Write now.

STRAUS & SCHRAM, (Inc.) Dept. 1379 W. 35th Street **CHICAGO**

B18

LOOK AT THIS Camera Bargain



3A Cartridge Premo, with Selected Meniscus Achromatic Lens, only

$5.68

Act To-Day!

or with Bausch & Lomb R. R. Lens—$7.75

The ideal camera for everyone. Easy to get good pictures with this high-grade Eastman machine. Pictures, 2½ x 4¼ inches. This great bargain is guaranteed on our usual *10 Days' Free Trial Plan.*

FREE Just send postal and get our splendid new Book of 1001 Camera Bargains and everything needed in the taking and making of good pictures. You will be amazed at the money making opportunities to be found here. **WRITE TO-DAY.** It is **FREE**—and every item as represented or your money refunded.

BASS CAMERA COMPANY
109 R Dearborn Street
CHICAGO, ILLINOIS

YOU NEED A

SUMMIT Knit-Nek Vest

It will keep you warm while working and allow you to move around with ease and comfort. The corduroy body is lined with leather and the sleeves are made of leather—keeping out the wind. The patented Knit-Nek and Wristlets keep you warm at the throat and arms.

Send for illustrated style book and give your dealer's name.

Guiterman Bros.
Dept. R
ST. PAUL, MINN.

"I Can Succeed!"

"What other men have accomplished through I. C. S. help, I can. If the I. C. S. have raised the salaries of other men, they can raise mine. If their positions have been bettered, mine can be. To me, I. C. S. means 'I CAN SUCCEED.'"

Get the "I Can Succeed" spirit, for the International Correspondence Schools *can* raise your salary—whether you're a dollar-a-day man or a dollar-an-hour man, a long-hour man or a short-hour man, young or old.

No matter where you live, what you now do, or how little time or money you may have, the I. C. S. have a Course of Training to fit *your* needs.

Hundreds of thousands of ambitious men have achieved success through I. C. S. help in the past 25 years—over 100,000 are *now* studying, getting ready for the big jobs ahead. Join them and make your life something to be proud of—you *can* do it.

Mark and mail the coupon TODAY and find out *how;* it won't obligate you in the least.

TEAR OUT HERE

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 5963, SCRANTON, PA.

Explain, without obligating me, how I can qualify for the position, or in the subject, *before* which I mark X.

- ☐ LOCOMOTIVE ENGINEER
- ☐ Locomotive Fireman
- ☐ Traveling Engineer
- ☐ Traveling Fireman
- ☐ Air Brake Inspector
- ☐ Air Brake Repairman
- ☐ Round House Foreman
- ☐ Trainmen and Carmen
- ☐ Railway Conductor
- ☐ MECHANICAL ENGINEER
- ☐ Mechanical Draftsman
- ☐ Machine Shop Practice
- ☐ Boiler Maker or Designer
- ☐ Stationary Engineer
- ☐ Gas Engine Operating
- ☐ CIVIL ENGINEER
- ☒ Surveying and Mapping
- ☐ R. R. Constructing
- ☐ Bridge Engineer
- ☐ ARCHITECT
- ☐ Architectural Draftsman
- ☐ Contractor and Builder
- ☐ Structural Engineer
- ☐ Concrete Builder
- ☐ TRAFFIC MANAGER
- ☐ BOOKKEEPER
- ☐ R. R. Agency Accounting
- ☐ R. R. Gen'l Office Acc'ting
- ☐ Higher Accounting
- ☐ Stenographer and Typist
- ☐ Mathematics
- ☐ SALESMANSHIP
- ☐ ADVERTISING
- ☐ Railway Mail Clerk
- ☐ CIVIL SERVICE
- ☐ ELECTRICAL ENGINEER
- ☐ Electrician
- ☐ Electric Wiring
- ☐ Electric Lighting
- ☐ Electric Railways
- ☐ Telegraph Engineer
- ☐ Telephone Work
- ☐ MINE FOREMAN OR ENG'R
- ☐ Metallurgist or Prospector
- ☐ CHEMIST
- ☐ AUTOMOBILE OPERATING
- ☐ Auto Repairing
- ☐ Good English
- ☐ AGRICULTURE
- ☐ Poultry Raising
- ☐ Spanish
- ☐ German
- ☐ French
- ☐ Italian

Name_____

Occupation & Employer_____

Street and No._____

City_____ State_____

In answering any advertisement on this page it is desirable that you mention RAILROAD MAN'S MAGAZINE.

Swear Off Tobacco

Tobacco Tells on Nervous System
Tobacco Ruins Digestion
Tobacco Stunts Boy's Growth
Tobacco Robs Man of Virility
Tobacco Steals from You the Pleasures, Comforts, Luxuries of Life

Tobacco Habit Banished In 48 to 72 Hours

Immediate Results

Trying to quit the tobacco habit unaided is a losing fight against heavy odds, and means a serious shock to your nervous system. So don't try it! Make the tobacco habit quit you. It will quit you if you will just take Tobacco Redeemer according to directions.

It doesn't make a particle of difference whether you've been a user of tobacco for a single month or 50 years, or how much you use, or in what form you use it. Whether you smoke cigars, cigarettes, pipe, chew plug or fine cut or use snuff—**Tobacco Redeemer** will positively remove all craving for tobacco in any form in from 48 to 72 hours. Your tobacco craving will begin to decrease after the very first dose—there's no long waiting for results.

Tobacco Redeemer contains no habit-forming drugs of any kind and is the most marvelously quick, absolutely scientific and thoroughly reliable remedy for the tobacco habit.

Not a Substitute

Tobacco Redeemer is in no sense a substitute for tobacco, but is a radical, efficient treatment. After finishing the treatment you have absolutely no desire to use tobacco again or to continue the use of the remedy. It quiets the nerves, and will make you feel better in every way. If you really want to quit the tobacco habit—get rid of it so completely that when you see others using it, it will not awaken the slightest desire in you—you should at once begin a course of **Tobacco Redeemer** treatment for the habit.

Results Absolutely Guaranteed

A single trial will convince the most skeptical. Our legal, binding, money-back guarantee goes with each full treatment. If **Tobacco Redeemer** fails to banish the tobacco habit when taken according to the plain and easy directions, your money will be cheerfully refunded upon demand.

Let Us Send You Convincing Proof

If you're a slave of the tobacco habit and want to find a sure, quick way of quitting "for keeps" you owe it to yourself and to your family to mail the coupon below or send your name and address on a postal and receive our free booklet on the deadly effect of tobacco on the human system, and positive proof that **Tobacco Redeemer** will quickly free you from the habit.

Newell Pharmacal Company
Dept. 319 St. Louis, Mo.

Free Book Coupon

NEWELL PHARMACAL CO.,
Dept. 319 St. Louis, Mo.

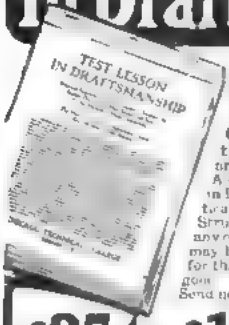
Please send, without obligating me in any way, your free booklet regarding the tobacco habit and proof that **Tobacco Redeemer** will positively free me from the tobacco habit.

Name.....

Street and No.....

Town..... State.....

Free Test Lesson In Draftsmanship



Special offer now. Pay nothing for this Test Lesson in Drafting prepared by the experts of the Chicago Technical College. Learn from a study of this lesson how well equipped you are to take up Drafting as a profession. A glance at the Chicago Tech Course in Draftsmanship will give you a practical training in Architectural, Electrical, Structural Steel, Machine Drafting or any other branch of Drafting in which you may be interested. No charge whatever for this lesson. Get it while the offer holds good. Just sign and mail the coupon. Send no money.

$25 to $100 a Week

Positions are always open to competent draftsmen and the war conditions are sure to create an extra demand. These positions pay good salaries and the well trained man always has the best opportunity for advancement. Our course gives you training in the shortest time consistent with thorough progress. Its practical value is proven by the success of our graduates. If you are a poor man and where the future looks doubtful if you want to be a technical expert if you want to be master of anything which will make you independent at last get the Free Lesson and the information we will send you free upon request.

Come to the College or Study At Home

You need not leave your present occupation to get the expert training in Drafting we often hear. We often hear. If you can spare an hour or two a day at home in your spare time we will show you how to do your work at the same time giving you a thorough training in Drafting. Our instructors are engineers, men who are experts in the very work you want to learn. They will show you how to do just what the big draftsmen in the Chicago offices do. Always in demand. Good salaries.

Builder's Course. We want to send carpenters, bricklayers, stonemasons and others who are interested in building work about their homes a Book on Building, Builders' Catalog and other instructive information.

FREE Instruments

Every student of the Chicago Tech" Course in Draftsmanship receives a complete set of drawing instruments or a cash credit in case he already has a set. We start our students at once in practical work with the necessary equipment.

Easy Payments

Pay for the course as you go along. The fee is so small and the terms so easy that no matter how moderate your income may be you can afford to get this practical Draftsmanship which will prepare you for an important pay raising position. All particulars sent free with Test Lesson.

See for Yourself

If you do nothing but secure the Free Test Lesson you will gain knowledge which will be helpful to you throughout life for this lesson gives the very fundamentals of Draftsmanship which are helpful to every man. Send for it today. Mail the coupon.

CHICAGO TECHNICAL COLLEGE
1232 Chicago "Tech" Building Chicago, Ill.

Chicago Technical College,
1232 Chicago "Tech" Building, Chicago

Without obligation upon me, please send your FREE Test Lesson in Draftsmanship and other interesting literature covering the subject indicated below.

Mark X opposite work in which you are specially interested.

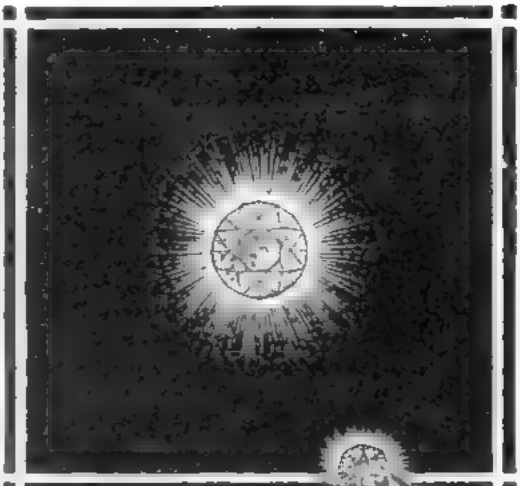
- ☐ Architectural Drafting
- ☐ Machine Drafting
- ☐ Electrical Drafting
- ☐ Structural Drafting
- ☐ Sheet Metal Drafting
- ☐ Builders' Course
- ☐ Plan Reading
- ☐ Estimating
- ☐ Surveying
- ☐ Map Drafting

Name .....

Address .....

City ..... State. .....

College or Home Study? State which .....



You Can Now Buy Direct

Buy any diamond you choose—direct from us—at our *rock-bottom* price. No jobber or retailer to pay. And every diamond absolutely guaranteed. Write at once for our net price list and Diamond Book showing exquisite collection of blue-white

Diamonds

Rings in all styles—settings Tiffany, Belcher, etc., La Vallieres, brooches and other diamond jewelry. Every diamond a superb gem. Selected by a famous expert. Perfectly cut to give maximum brilliancy. Richly mounted in solid gold and platinum settings.

Free Examination

Not a cent down—you see the diamond before you accept it. We want you to compare these diamonds with others at twice their price.

$2.50 Monthly

Only $2.50 a month will make you the wearer of a beautiful diamond ring. Other terms, $3.50, $4.50 and up—and middlemen's profits are cut out.

Write

For Net Price List and Diamond Book

Shows the different gems, styles of mountings and gives our *rock bottom prices* with terms of payment. Do it now—today.

BURLINGTON WATCH CO.
Dept. 1099
Chicago, Ill.

Burlington Watch Co.
Dept. 1099
Chicago Illinois

Without obligations send me your net price offer on diamonds, also send Diamond Book.

Name .....

Address .....

From telegrapher to lawyer in six months

Won his success through reading law at home in his spare time

IT was the supreme ambition of a young telegraph operator in Cleveland, Tennessee—J. C. Rector—to become a lawyer. Little did he think, at first, that his ambition would be realized, because he could not afford to go away to school.

Then one day a friend told him of the Blackstone Institute's home-study course of law training, and he enrolled. How successful was the result Rector himself tells in the following letter:

Brilliantly won his first case

"In six months and eighteen days after I read your course I passed the State bar examination. Within ten minutes after I had been sworn in the judge appointed me to defend a case involving an assault with intent to commit murder. . . . . Though I went into the trial on five minutes' preparation, I succeeded in clearing the man on the plea of self-defense. . . . . Things are now coming my way exceedingly fast and within another year I will be getting a great deal more than my share of the business here.

We bring the law to you

Although few men complete the Blackstone course of law within so short a period as six months, the success of J. C. Rector is not exceptional. You, too, can master it in your spare time and successfully pass the bar examination after the term of preparation prescribed by your state.

The Modern American Law Course and Service of the Blackstone Institute has been carefully prepared by eighty recognized legal authorities. This course gives you a thorough practical grounding in the fundamental principles of law, under the personal guidance of experienced and able lawyers and law trained business men.

"The Law Trained Man"

Our new 168-page book, "The Law Trained Man," tells you how a law training will help you become successful in business or public life. Simply mail the coupon below with your name and address plainly written or typed and it will be sent you free.

BLACKSTONE INSTITUTE

Dept. 169, 608 S. Dearborn St., Chicago

Send me "The Law Trained Man" 168-page book FREE.

Name .....

Business Position .....

Address ..... City ..... State .....

Check with X { For Business [ ] For Admission to the Bar [ ]

Blackstone Institute

Dept. 169, 608 S. Dearborn Street, Chicago, Ill.

Train As An Expert In Interstate Commerce

Be ready to answer the call for men who know how to handle complicated tariff problems for large shippers, railroads and municipalities. Over half a million great business organizations need Commerce Counselors, Traffic Managers and Directors of Transportation. They are ready to pay large salaries but not enough trained men are available to fill the places. The opportunity is ready and you can prepare for it by taking the course of training in Interstate Commerce and Railway Traffic by mail offered by

LaSALLE EXTENSION UNIVERSITY

"The World's Greatest Extension University"

Study under experts. Learn all about Freight Rates, Classifications, Tariffs, Bills of Lading, Routing, Claims, Demurrage, Ocean Trade, Reorganization, Laws of Carriers etc., from men who have been through every phase of the work and will give you the benefit of their experience with large railroads and shippers.

You can get all this by home study and you can pay for the course a little each month if you wish. Over 125,000 business men have enrolled in our various departments. 3,000 new students now enroll monthly. The LaSalle organization consists of 800 people including a staff of 200 business experts.

WRITE Get full information about the course and our free Counsulting Service. Also our valuable book, "Ten Years' Promotion In One." Write today stating what your present position is.

LASALLE EXTENSION UNIVERSITY

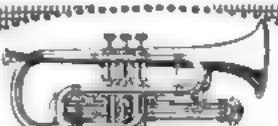
"The World's Greatest Extension University"

Dept. 1265-C **Chicago, Illinois**

Remoh Gems

Look and wear like diamonds. Brilliancy guaranteed forever. Stand fire and acid tests like diamonds. Have no paste foil or bark. Are set only in 14 karat solid gold mountings. About 1/30th the price of diamonds. A marvelous substitute gem with no glass. **Guaranteed not an imitation and to contain no glass.** Sent C. O. D. subject to examination. Write today for our free catalog.

Remoh Jewelry Co., 1105 Washington Ave., St. Louis, Mo.



WURLITZER

Suppliers of U. S. Army

10¢ a Day

buys this superb triple silver-plated Lyric Cornet. Sent to you on free trial. Play on it a week before you decide to buy. Test it in every way right in your own home. Handsome carrying case free on special offer.

Write Today for catalog 194 page book. Take your choice of any instrument made. Sold direct to you at the rock bottom prices.

THE RUDOLPH WURLITZER COMPANY—Dept. 1099
East 4th Street, Cincinnati, Ohio
South Wabash Avenue, Chicago, Ill.

The W. D. C. triangle trade-mark has been the sign of supreme pipe value for more than 50 years. It is on pipes of every style, size and grade. See that it is on yours.

A Gift That Is Sure To Please

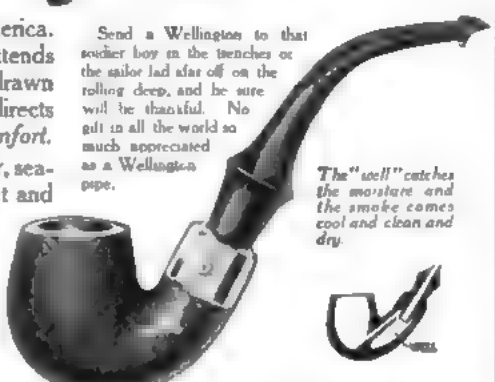
Wellington

THE UNIVERSAL PIPE

THE Wellington is the most popular pipe in America. It will not wheeze or bubble. The "well" attends to that. Crumbs of tobacco cannot possibly be drawn up into the mouth. The upward bore of the bit directs the smoke away from the tongue—*real pipe comfort.*

The Wellington is made of genuine French Briar, seasoned by our special process. It breaks-in sweet and mellow. The bowl is guaranteed against cracking or burning through. Any tobacco tastes better in a Wellington. A shape for every face—a price for every pocketbook.

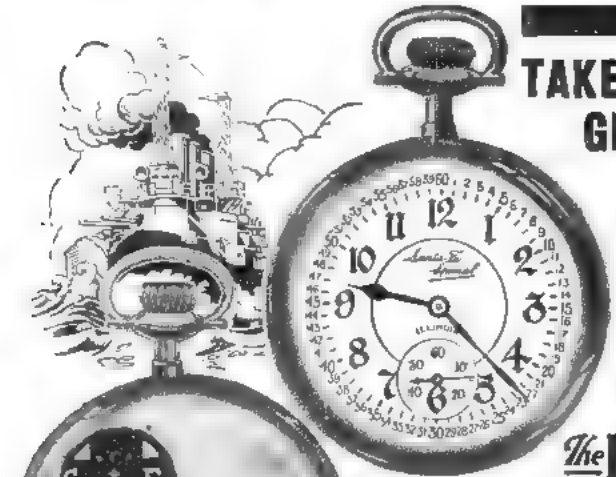
Send a Wellington to that soldier boy in the trenches or the sailor lad afar off on the rolling deep, and he sure will be thankful. No gift in all the world so much appreciated as a Wellington pipe.



The "well" catches the moisture and the smoke comes cool and clean and dry.

AT ALL GOOD DEALERS
50c and up

WM. DEMUTH & CO.—*World's Largest Pipe Manufacturers*—**New York**



TAKE ADVANTAGE OF OUR GREAT WATCH OFFER FOR CHRISTMAS

Write today and receive the beautiful watch book telling all about this most remarkable of watch offers.
Shows all sizes of watches from men's to the daintiest bracelet watch, ideal gifts for the ladies.

WATCH PRICES SHATTERED!
Read This Astounding OFFER

READ ABOUT THIS WATCH

21 perfect Jewels

Adjusted to Positions

Adjusted to Isochronism

Adjusted to Temperature

3-Color Inlay Cases New Designs

The ILLINOIS Famous $ Santa Fe Special 21 JEWEL RAILROAD WATCH 2.50 A MONTH

Important One of the most remarkable sales of watches ever [illegible] is now going [illegible]. We are distributing 5,000 Santa Fe Special Watches to men who will help us extend the NEWS about this remarkable RAILROAD WATCH. PROFITS ARE ELIMINATED. Every watch is of the latest 21 Jewel Adjusted Model. Two lines of the Santa Fe Watch [illegible] and one that is RENT and highest tested watch ever produced.

We want every Railroad Man to take advantage of this GREAT SALE. [illegible] Santa Fe Special Watch to the members of [illegible] and a few of friends. That's all we ask. This [illegible] not be made except for the purpose of the Railroad Man's Magazine and for the [illegible] great reading matter of this publication. The extraordinary sale prices mean an enormous sacrifice owing to advancing costs of materials, skilled labor and our slaughter of prices.

Save 1/3 to 1/2 of Your Money

This offer is going [illegible] over the United States. Act now if you want to get [illegible] watches. A few weeks have already passed since the offer went into effect. Write today for the EXTRA DISTRIBUTION AN-NOUNCEMENT before the allotment is gone. You get the advantage of an extremely low price.

Send Your Name Today

Clip the coupon, fill out and receive the free watch book right off the press. All the newest watch case designs are shown. Read our easy payment offer. Wear the watch 30 days Free. Watch set for your examination and approval without a penny down. Nothing to risk. See the watch before you buy.

SANTA FE WATCH CO., Dept. D-I. TOPEKA, KANS.
Home of the Great Santa Fe R. R.

A letter, a postal or this coupon will bring the Free Watch Book

SANTA FE WATCH CO., Topeka, Kansas, Dept. D-I.

Please send me the New Watch Book with the understanding that this request does not obligate me in any way.

Name .....

Address ..... State .....

DRAWING

LEARN BY MAIL IN YOUR OWN HOME

Newspaper, Magazine and Commercial Illustrating, Cartooning, Water-color and Oil Painting. Learn Drawing for profit and pleasure. We can develop your talent. This school has taught thousands. Free Scholarship Award—special limited offer. Your name and address brings you full explanation and our handsome illustrated Art Annual by return mail. Don't delay. Write today.

FINE ARTS INSTITUTE, Studio 419, OMAHA, NEB.

Pay As You Wish

We send you a genuine Lachnite Gem for 10 days free trial. Put it to every diamond test, fire and the diamond file, make it prove itself. Then if you can tell it from a mined diamond send it back at our expense. If you decide to keep it pay as you wish. Write now.

Set In Solid Gold

Genuine Lachnite Gems keep their dazzling fire forever. The newest mountings in all kinds of jewelry. Write today for free new jewelry book and catalog.

HAROLD LACHMAN COMPANY,
12 No. Michigan Ave., Dept. 1089, Chicago, Illinois

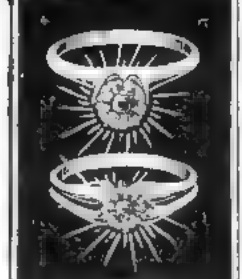
316

ANY WATCH YOU WANT On Credit

1918-MODELS
HOWARD
HAMPDEN
SOUTH-BEND
ELGIN
WALTHAM
HAMILTON
ILLINOIS

WRITE FOR GREAT NEW OFFERS

From Square Deal Miller you can get the watch you want at manufacturer's cash prices but on the easiest terms. In the new Miller-Hoefer catalog, the latest models of America's best known time-pieces are listed, also **Genuine Diamonds,** and a vast assortment of **Jewelry**—all on **Credit,** all on **Free Approval,** all on **30 Days' Trial,** and all **Guaranteed.** This new book is yours for the asking. The coupon, or your name and address on a post card brings it **Free.**



Buy A Diamond On Credit

Better Than a Bank

The Miller-Hoefer Company sells only the highest grade, finest quality, perfect diamonds. It is the only kind to buy, the best investment possible. Catalog shows hundreds for your selection. Choose any one for **Free Examination**

Factory Prices and Easy Terms

Your Money Back If You Can Buy Cheaper for Cash

Send No Money

You need not send one penny with any order for a Watch, a Diamond, or any Jewelry, unless you prefer. I will send you anything you select for **Free Examination**—even pay the express charges. Only after you find the goods are as represented, need you pay the first payment of my **Easy Credit Terms.**

30 Days' FREE Trial

After a test in your own possession of any Watch, Diamonds, or Jewelry, should you want to return the goods, you can do so **and your money will be refunded** That is the way the Miller Hoefer Company has taken the risk out of mail order buying how it assures every customer of a Square Deal, but this is not all—

The Miller-Hoefer Credit Plan

No Reference Demanded — An Open Account

A New Kind of Credit—liberal—dignified—open and above board. You can have an **Open Account** the same kind of credit you get from your grocer. **No Interest—No Notes—No Bank Guarantee—No Red Tape—No Collectors**—just plain honesty between one man and another.

Send Coupon Today I want you to have my new **Free Book** if you are interested in Watches, Diamonds, or Jewelry. **It's Free and Postpaid.** Remember—there is no obligation—just the opportunity if you wish, to take advantage of the most liberal, squarest, Watch, Diamond, and Jewelry offer ever made.

SQUARE DEAL MILLER, Pres.
MILLER-HOEFER CO.
33 State St., Dept. 948 DETROIT, MICH.

VALUABLE CATALOG FREE

Square Deal Miller, Pres. Miller-Hoefer Co.
33 State St., Dept. 948 Detroit, Mich.
Dear sir: Please send me your FREE Watch, Diamond and Jewelry Catalog as advertised.

NAME .....

ADDRESS .....

Our 21 Jewel SMASHES PRICES

Look!

- 21 Ruby and Sapphire Jewels—
- Adjusted to the second—
- Adjusted to temperature—
- Adjusted to isochronism—
- Adjusted to positions—
- 25-year gold strata case—
- Genuine Montgomery Railroad Dial—
- New Ideas in Thin Cases.

Only $2.50 A Month

And all of this for $2.50—only $2.50 per month—a great reduction in watch prices—direct to you—positively the exact prices the wholesale dealer would have to pay. Think of the high-grade, guaranteed watch we offer here at such a remarkable price. And, if you wish, you may pay this price at the rate of $2.50 a month. Indeed, the days of exorbitant watch prices have passed.

See It First

You don't pay a cent to anybody until you see the watch. You don't buy a Burlington Watch without seeing it. Look at the splendid beauty of the watch itself. Thin model, handsomely shaped—aristocratic in every line. Then look at the works! There you will see the masterpiece of the watch makers' skill. A perfect timepiece adjusted to position, temperature and isochronism.

Every fighting vessel in the U. S. Navy has the Burlington Watch aboard. Many have over 100 Burlingtons—a few over 200. This includes every torpedo boat—every submarine as well as the big Dreadnoughts.

Burlington Watch Co.
19th Street and Marshall Blvd.
Dept. 1099 Chicago, Ill.

Please send me (without obligation and prepaid) your free book on watches with full explanation of your cash or $2.50 a month offer on the Burlington Watch.

Name.....

Address.....

Send Your Name on This Free Coupon

Get the Burlington Watch Book by sending this coupon now. You will know a lot more about watch buying when you read it. You will be able to "steer clear" of the over-priced watches which are no better. Send the coupon today for the watch book and our offer.

Burlington Watch Co.
19th St. & Marshall Blvd., Dept. 1099, Chicago, Ill.

B18

Wh-r-r! Whr-r-r! Whr-r-r-r-r-r-r!

Spare your batteries

How winter starting is often made easier by a lower-cold-test oil

YOU press on your starter button in summer. Whr-r-r! The engine is under way.

But winter comes. Whr-r-r! Whr-r-r-r-r! Whr-r-r-r-r-r—. Now starting is difficult.

True, the engine *is* colder. And gasoline vaporizes less readily. Starting is helped if you prime the cylinders, flood the carburetor or heat the intake manifold.

But there is one factor in overcoming this trouble that many car owners overlook. This is—correct lubrication. The lubricating requirements of your car may demand a different grade of oil in winter. There are many factors to reckon with. The type of feed system is one. The size of the oil drillings is another. Exposed oil piping is a possible third. Other factors also enter in.

Of the 1917 cars, 112 require a different grade of oil to meet winter conditions. The correct winter oil is listed for each make of car in our Complete Chart of Automobile Recommendations shown in part at the right.

Where no change is indicated you may be sure that the grade of Gargoyle Mobiloils specified is correct for both summer and winter. Where a change is recommended, it is wise to follow the Chart's advice.

Write for new 56 page booklet containing complete discussion of your lubrication problems, list of troubles with remedies and complete Charts of Recommendations for Automobiles, Motorcycles, Tractors and Motorboat Engines.

GARGOYLE

Mobiloils

A grade for each type of motor

The four grades of Gargoyle Mobiloils for engine lubrication, purified to remove free carbon, are:

Gargoyle Mobiloil "A" **Gargoyle Mobiloil "E"**
Gargoyle Mobiloil "B" **Gargoyle Mobiloil "Arctic"**

Electric Vehicles—For motor bearings and enclosed chains use Gargoyle Mobiloil "A" the year 'round. For open chains and differential, use Gargoyle Mobiloil "C" the year 'round.

Exception—For winter lubrication of pleasure cars use Gargoyle Mobiloil "Arctic" for worm drive and Gargoyle Mobiloil "A" for bevel gear drive.

In buying Gargoyle Mobiloils from your dealer, it is safest to purchase in original packages. Look for the red Gargoyle on the container. If your dealer has not the grade specified for your car, he can easily secure it for you.

VACUUM OIL COMPANY

Rochester, N. Y., U. S. A.

Specialists in the manufacture of high-grade lubricants for every class of machinery. Obtainable everywhere in the world

Domestic Branches: Detroit, Boston, New York, Kansas City, Kan., Chicago, Philadelphia, Indianapolis, Minneapolis, Pittsburgh, Des Moines

Correct Automobile Lubrication

Explanation: In the Chart below, the letter opposite the car indicates the grade of Gargoyle Mobiloils that should be used. For example, "A" means Gargoyle Mobiloil "A". "Arc" means Gargoyle Mobiloil "Arctic," etc. The recommendations cover all models of both pleasure and commercial vehicles unless otherwise noted.

This Chart is compiled by the Vacuum Oil Co.'s Board of Engineers and represents our professional advice on Correct Automobile Lubrication.

Model of	1917		1916		1915		1914		1913	
CARS	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
Abbott-Detroit	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	A	Arc
" (8 cyl)			A	A	A	A				
Allen	A	Arc	A	Arc	A	Arc	A	A	A	A
" (Mod. 32-36-38)					A	Arc				
American	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
" (8 cyl)	A	A	A	A						
Auburn (4 cyl)	A	A	A	Arc	A	Arc	A	A	A	A
" (6 cyl)	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc		
Austin (4 cyl)	A	Arc	A	Arc	A	Arc	A	A	A	Arc
Bessac	A	A	A	Arc	A	Arc	A	Arc		
" (8 cyl)			A	A						
Buick	Arc	Arc	Arc	Arc	Arc	Arc	A	Arc	A	Arc
Cadillac							Arc	Arc	Arc	Arc
" (8 cyl)	A	A	A	A	Arc	Arc				
Case	A	Arc	A	Arc	A	Arc	A	Arc	A	Arc
Chalmers			Arc	Arc	Arc	Arc	A	A	Arc	Arc
" (Mod. 6-40)			A	A						
" (Mod. 6-30)	A	A	A	A						
Chandler Six	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc		
Chevrolet	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	A	A
Cole			A	A	A	Arc	Arc	Arc	Arc	Arc
" (8 cyl)	A	A	A	A						
Columbia					Arc	Arc	Arc	Arc	A	A
" (8 cyl)	A	A	A	A						
Dort	A	Arc	A	Arc	A	Arc	A	A	A	Arc
" (Mod. C)	A	Arc	A	Arc	A	Arc	A	A		
Dorris-Six	Arc	Arc	Arc	Arc	Arc	Arc	A	A	A	Arc
" (8 cyl)										
Dodge	A	Arc	A	Arc	E	E				
Dort	A	Arc	A	Arc	A	Arc				
Empire (4 cyl)	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
" (6 cyl)	Arc	Arc	Arc	Arc						
Federal	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
Ford	E	A	E	A	E	A	E	A	E	A
Ford	E	A	E	A	E	A	E	A	E	A
Franklin	A	A	A	A	A	A	A	A	A	A
Grant	A	Arc	A	Arc	Arc	Arc	Arc	Arc		
Hal Twelve	A	Arc	A	Arc						
Hanson	A	A	A	A	A	Arc	A	Arc	A	Arc
" (12 cyl)	A	A	A	A						
Hudson			Arc	Arc	Arc	Arc	Arc	Arc	A	Arc
" (Super-Six)	A	Arc	A	Arc						
Hupmobile	A	Arc	A	Arc	A	Arc	A	Arc	A	Arc
Jeffery	A	Arc	A	Arc	A	Arc	A	A		
" (Rambler)	A	A								
" (Four)	A	A	A	Arc	A	Arc	Arc	Arc	Arc	Arc
Kissel			E	E	E	E				
" (Four)	A	Arc	A	Arc	A	Arc				
Kissel Springfield	A	A	A	A	A	Arc	A	A	Arc	Arc
King			A	A	A	Arc	A	A	E	E
" (Four)	A	A	A	A						
" (Six)	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc		
Krit	A	Arc	A	Arc	A	Arc	A	Arc	A	Arc
Kissel Six	A	Arc	A	Arc	A	Arc	A	Arc	Arc	Arc
" (Four)	A	Arc	A	Arc	A	Arc	A	Arc	Arc	Arc
" (Mod. 48)			A	A	A	A	A	A		
" (12 cyl)	A	A								
Lexington	Arc	Arc	Arc	Arc	Arc	Arc				
Liberty Sextet			Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
" (Mod. 30)	A	Arc	A	Arc						
" (Mod. 35-39)	A	Arc	A	Arc						
Lozier	E	E	E	E	E	E	E	Arc	Arc	Arc
McFarlan	A	Arc	A	A	A	Arc	A	A	A	Arc
Marmon	A	A	A	A	A	Arc	A	Arc	A	Arc
Maxwell	A	Arc	A	Arc	A	Arc	A	Arc	A	Arc
Mercer	A	A	A	A	A	Arc	A	Arc	A	Arc
" (Six-66)					Arc	Arc				
Mitchell	A	Arc	A	Arc	A	Arc	A	Arc	A	Arc
Moline-Knight			A	A					A	Arc
" (6 cyl)	A	A	A	A	A	A	A	A		
" (8 cyl)	A	A	A	A	A	A	A	Arc	Arc	Arc
Moon (4 cyl)					A	Arc	A	Arc	Arc	Arc
" (6 cyl)	Arc	Arc	Arc	Arc	Arc	Arc				
National	Arc	Arc	A	Arc	A	Arc	A	A	A	A
" (4 cyl)	A	A	A	A						
Oakland			A	A	Arc	Arc	Arc	Arc	A	Arc
" (8 cyl)			A	A						
Oldsmobile			Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
" (6 cyl)	A	A	A	A						
Overland	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
Packard					Arc	Arc	Arc	Arc	Arc	Arc
" (Twin Six)	A	A	A	A	A	Arc	A	A		
" (Single Six)	A	A	A	A						
Paige					A	Arc	A	A	E	E
" (6-45)	Arc	Arc	Arc	Arc	Arc	Arc				
" (6-38 & 39)	Arc	Arc	Arc	Arc	Arc	Arc				
Parkhurst	A	Arc	A	Arc	Arc	Arc	Arc	Arc	A	Arc
" (6 cyl)	A	A	A	A						
Peerless	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
" (6 cyl)	A	A	A	A						
Pierce Arrow	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
" (Four)	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
Premier	A	A	A	Arc	A	Arc	A	Arc	A	Arc
Reo	A	Arc	A	Arc	A	Arc	A	Arc	A	Arc
" (6 cyl)			A	A	A	Arc	A	Arc	A	Arc
Republic (4 cyl)			A	A	A	Arc	A	Arc	A	Arc
Rex	A	Arc	A	Arc	A	Arc	A	Arc	A	Arc
Richmond	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
Rikel	E	E	E	E	E	E	E	E		
Saxon	A	A	A	A	A	A	A	A	A	A
Scripps-Booth	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
Simplex	A	A	A	A	A	Arc	Arc	Arc	Arc	Arc
Stearns-Knight	A	A	A	A	A	A	A	A	A	A
" (8 cyl)	A	A	A	A						
Stephens	A	A	A	A	Arc	Arc	A	Arc	A	Arc
Stutz	A	A	A	A	A	A	A	A	Arc	Arc
Velie (4 cyl)					A	Arc	A	Arc	A	Arc
" (6 cyl)	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc		
Westcott	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	A	Arc
White	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
" (16 valve)	A	A								
Willys-Knight	A	A	B	A	B	A	A	A		
Willys-Six	Arc	Arc								
Winton	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc

THE MUNSEY PRESS, NEW YORK